Cropping rotation system data of China

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Abstract: The cropping rotation is one of essential factors for agriculture in China, because it has been shown to significantly increase the grain yield and promote agricultural development. Cropping Rotation System Data in China (CropSysChina) is the research results of multiple-cropping system in China under climate change. The CropSysChina is spatial-temporal data of multiple-cropping system under the rain-fed and irrigated scenarios at intervals of 10 years from the 1960s to the 2000s with a 1 km spatial resolution with the model support from the Global Agro-Ecological Zones Model (AEZ, FAO, IIASA). The calculated potential multiple-cropping system in 2000 was compared with the actual result from remote sensing monitoring based on MODIS data, and it was consistent with the actual system overall.

Keywords: China; farmland; multiple; cropping; rotation
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1 Introduction

The method of multiple cropping rotations is one of the most effective agriculture to increase grain yield and to promote food security in China, where the climate is suitable for doing so (i.e. light, temperature, rainfall and so on). Nearly half of the cultivated land in China is subject to Multiple Cropping Rotations (MCR). The MCR also helps to alleviate competition for land use between food and economic crops. CropSysChina is one of research results of multiple-cropping system in climate change in China from 1960 to 2010.

2 Metadata of the cropsysChina

The descriptions of the Cropping Rotation System Data of China (CropSysChina for short) dataset are recorded. These information include the dataset full name, dataset short name, corresponding author, authors, geographical region of the dataset content, year of the dataset, number of the dataset tiles, dataset spatial and temporal resolution, dataset format and size, data publisher, data sharing platform and contact information, technical editors, foundation and the data sharing policy. Table 1 below summarizes the main metadata

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Table 1 Summary of the CropSysChina Metadata

Full name	Cropping rotation system data of China
Short name	CropSysChina
Corresponding author:	XU Xinliang (xuxl@lreis.ac.cn)
Authors	XU Xinliang, Institute of Geographic Sciences and Natural Resources Research, Chinese Academy of Sciences, xuxl@lreis.ac.cn LIU Luo, Xinjiang Institute of Ecology and Geography, Chinese Academy of Sciences, University of Chinese Academy of Sciences, liuluo87930@qq.com
Geographical region	The region extends from 18°00' to 53°33'N and 73°33' to 153°5'E, Mainland of China.
Year of the dataset	1960-2010
Spatial resolution	1 km
Data format	ARCGIS GRID Dataset size 187kb
Data publisher	Global Change Research Data Publishing and Repository, DOI: 10.3974
Data access and services platform	Global Change Research Data Publishing and Repository, Institute of Geographic Sciences and Natural Resources Research, Chinese Academy of Sciences, http://www.geodoi.ac.cn National Data Sharing Infrastructure of Earth System Sciences of China, http://www.geodata.cn
Academic editors	LIU Chuang, SHI Ruixiang, LV Tingting, HE Shujin
Data sharing policy	The authors of the dataset agree to publish the data here according to the Article I of Data Sharing Policy of the Global Change Data Publishing and Repository, which states that the dataset can be used freely for research, education, and decision making; any users for commercial uses should get formal permission from IGSNRR/CAS.

elements of the CropSysChina dataset.

3 Methods

The data of CropSysChina is derived from the Global Agro-Ecological Zones Model (AEZ, FAO, IIASA) and series of China dataset on climate from 1960- 2010. The detail descriptions have been published on Changes in the potential multiple-cropping system in response to climate change in China from 1960- 2010 at PLOS one by Liu L, et al.[1].

Table 2 Delineation of multiple cropping zones in the tropics[1]

Zone	LGP	$LGP_{t=5}$	$LGP_{t=10}$	$TS_{t=0}$	$TS_{t=10}$	$TS\text{-}G_{t=5}$	$TS\text{-}G_{t=10}$
A	-	-	-	-	-	-	-
B	⩾45	⩾120	⩾90	⩾1600	⩾1000	-	-
C	⩾220	⩾220	-	⩾5500	n.a.	-	-
	⩾200	⩾200	⩾120	⩾6400		⩾3200	⩾2700
	⩾180	⩾200	-	⩾7200		-	-
	⩾270	⩾270	-	⩾5500		-	-
D	⩾240	⩾240	⩾165	⩾6400	n.a.	⩾4000	⩾3200
	⩾210	⩾240	-	⩾7200		-	-
E	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
F	⩾300	⩾300	⩾240	⩾7200	⩾7000	⩾5100	⩾4800
G	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
H	⩾360	⩾360	⩾360	⩾7200	⩾7000	-	-

To assess the potential multiple-cropping systems, a number of multiple cropping zones were defined by matching both the thermal and water requirements with the time required for crop growth in different latitudinal thermal climates. The following parameters were used to define the cropping zones (Tables 1 and 2): length of the growing period (LGP), number of days with mean daily temperatures above 5 ºC and 10 ºC ($LGP_{t=5}$ and $LGP_{t=10}$), accumulated temperature on days with a mean daily temperature ³ 0 ºC and ³ 10 ºC ($TS_{t=0}$ and $TS_{t=10}$) and accumulated temperature during the growing period with a mean daily temperature ³ 5 ºC and 10 ºC ($TS\text{-}G_{t=5}$ and $TS\text{-}G_{t=10}$). To reveal the impact of water conditions on the multiple-cropping systems, two scenarios (irrigated and rain-fed) were considered for the calculation of the potential multiple-cropping systems. The rain-fed scenarios were obtained from the light-temperature-water condition, while the irrigated scenarios were calculated using only the light-temperature conditions, which assumed sufficient water for crop growth. The two scenarios

were consistent with two existing agricultural management methods in China (naturally rain- fed farmland and irrigated farmland). The water- limited condition referred to the LGP and TS-G mentioned previously with an additional requirement that indicated moisture was insufficient ($ET_a < 0.4\ ET_0$)[2-9].

4 Dataset description

The CropSysChina are spatial-temporal data of multiple- cropping system under the rain- fed and irrigated scenarios at intervals of 10 years from the 1960s to the 2000s with 1 x 1 km grid. There are two datasets, they are: Cropping Rotation System Resources in

Table 3 Delineation of multiple cropping zones in non-tropics zones[1]

Zone	LGP	$LGP_{t=5}$	$LGP_{t=10}$	$TS_{t=0}$	$TS_{t=10}$	$TS\text{-}G_{t=5}$	$TS\text{-}G_{t=10}$
A	-	-	-	-	-	-	-
B	⩾ 45	⩾120	⩾90	⩾1600	⩾1000	-	-
C	⩾180	⩾200	⩾120	⩾3600	⩾3000	⩾3200	⩾2900
D	⩾210	⩾240	⩾165	⩾4500	⩾3600	⩾4000	⩾3200
E	⩾240	⩾270	⩾180	⩾4800	⩾4500	⩾4300	⩾4000
F	⩾300	⩾300	⩾240	⩾5400	⩾5100	⩾5100	⩾4800
G	⩾330	⩾330	⩾270	⩾5700	⩾5500	-	-
H	⩾360	⩾360	⩾330	⩾7200	⩾7000	-	-

Note: A. Zone of no cropping (too cold or too dry for rain- fed crops), B. Zone of single cropping, C. Zone of limited double cropping (relay cropping; single wetland rice cropping may be possible), D. Zone of double cropping (sequential cropping; double cropping with wetland rice cropping not possible), E. Zone of double cropping (sequential cropping; wetland rice cropping possible), F. Zone of limited triple cropping (partial relay cropping; no third cropping possible in case of two wetland rice crops), G. Zone of triple cropping (sequential cropping of three short- cycle crops; two wetland rice crops possible), H. Zone of triple rice cropping (sequential cropping of three wetland rice crops possible)

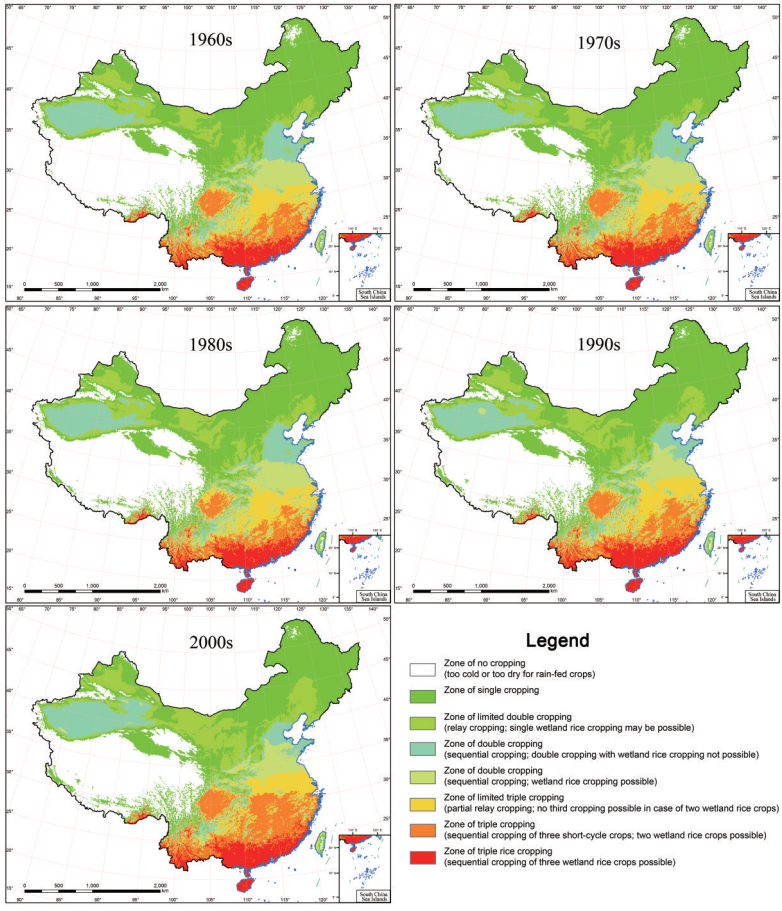

Figure 1 Distribution of multiple-cropping system under the irrigated scenario[1]

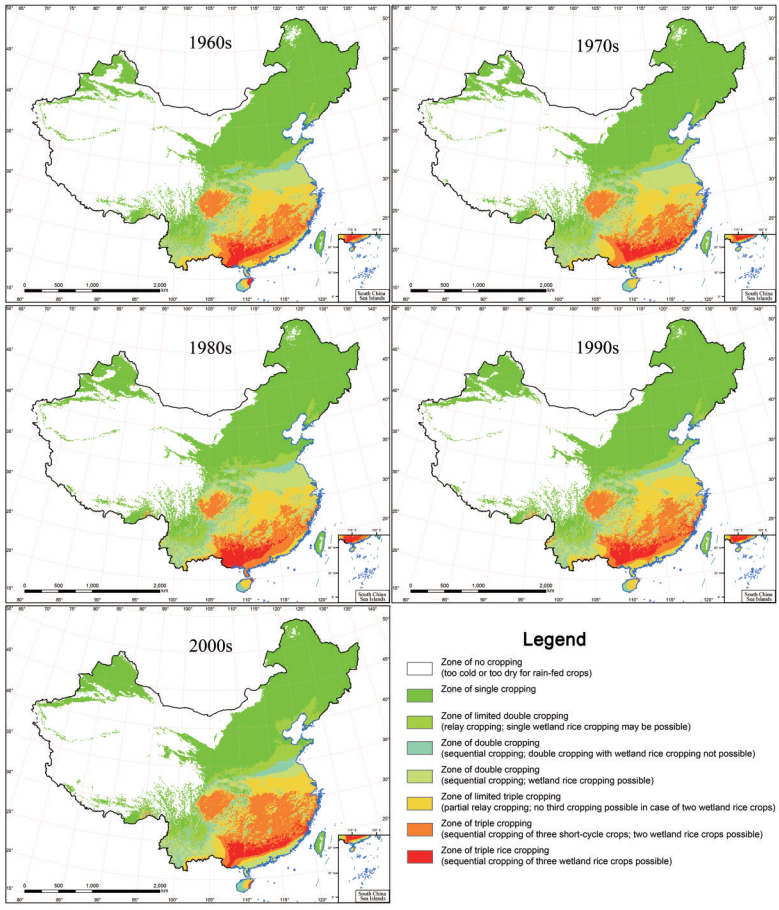

Figure 2 Distribution of multiple-cropping system under the rain-fed scenario[1]

China under irrigated scenario (CropSysChina1.zip) and Cropping Rotation System Resources in China under rain-fed scenario (CropSysChina2.zip)[10-11].

4.1 Cropping rotation system resources in China under irrigated scenario (CropSysChina1.zip)

CropSysChina1.zip is a compressed file of multiple- cropping system under irrigated scenario with data format of ARCGIS GRID, and its size is 96 KB (Figure 1).

4.2 Cropping rotation system resources in China under rain- fed scenario (CropSysChina2.zip)

CropSysChina2.zip file is a compressed file of multiple-cropping system under rain-fed scenario with data format of ARCGIS GRID, and its size is 83 KB (Figure 2).

5 Dataset quality control and validation

To verify the accuracy of the calculated results, the calculated potential multiple-cropping system in 2000 was compared with the analysis result from remote sensing monitoring based on MODIS data. Figure 3 demonstrates that the potential multiple-cropping system was consistent with the actual system overall.

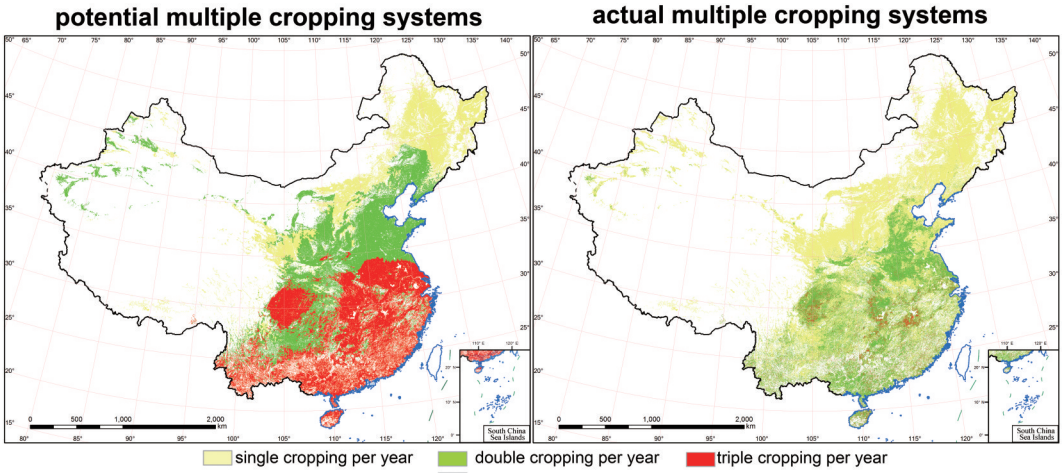

Figure 3 Comparison between potential and actual multiple-cropping system in 2000[1]

6 Conclusion

The CropSysChina is spatial data of potential multiple-cropping system at intervals of 10 years from the 1960s to the 2000s with 1 km spatial resolution. It is a useful data in analyzing agriculture environment, exploring potential agriculture production and agriculture assessment and sustainable development.

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