

Suitability assessment data on marginal land resources for cultivating bio-energy crops of Asia

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Abstract: Biodiesel from bio-energy crops is expected to play an increase role in solving energy crisis. Thus, large-scale cultivation of bio-energy crops causes worldwide attention. Asia is the most populous continent and has a really fast speed of economic growth which causes a massive increase in energy demand. This dataset from the suitability assessment of marginal land resources for cultivating bio-energy crops without affecting food security. A multi-factor analysis method was applied to identify marginal land available for bioenergy development and multiple datasets were used as background including the natural characteristics of bio-energy crops and geographic data. The results indicate that the marginal land resources in Asia are about 16.99 million km². The validations were conducted in Wuhan Botanical Garden of the Chinese Academy of Sciences and South China Botanical Garden with the accuracy higher than 85%. This dataset provides important support to the large-scale cultivation of energy plants and sustainable development of bioenergy.

Keywords: Asia; bio-energy crops; marginal land; data

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1 Introduction

Suitability assessment data on marginal land resources for cultivating bio-energy crops of Asia (MarginalLand_Asia_2010 for short) is one of the achievements in the field of bio-energy in Asia. The authors of this dataset have done a series of work on the marginal land resources; some of the research papers about this study have been published. This dataset is one of series marginal land resources data. The marginal land suitable for Cassava, Pistacia chinensis and Jatropha curcas L will be published as well.

2 Dataset description

The descriptions of the suitability assessment data on marginal land resources for cultivating bio-energy crops of Asia (MarginalLand_Asia_2010) dataset are recorded. These information include the dataset full name, dataset short name, corresponding author, authors,

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Table 1 Summary of the MarginalLand_Asia_2010 metadata

Full name of dataset	Suitability assessment data of marginal land resources for cultivating bio-energy crops of Asia		
Short name of dataset	MarginalLand_Asia_2010		
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Geographical region	Asia locates from latitudes 1°16' N and 77°43' N, and longitudes 26°3'E and 169°40' W.		
Year of the dataset	2009		
Spatial resolution	1 km		
Data format	ARCGIS GRID	Dataset size	102MB
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, ZHU Yunqiang, 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.		

Table 2 Indicators for identifying marginal land resources of Asia

Indicators data		Data sources
Land cover	Grassland, shrub land, bare land et al.	ESA 2010 and UCLouvain ^[1]
Terrain	Slope	SRTM ^[2]
Meteorological data	Precipitation	WorldClim ^[3]
	Accumulated temperature	
Soil data	Organic matter content	FAO/IIASA/ISRIC/ISS-CAS/JRC ^[4]
	Soil depth	

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

Table 3 Growing conditions of bio-energy crops

Factors	Index value
Slope	<25°
Organic matter content (%)	>1.5
Soil depth (cm)	≥20
Precipitation (mm)	≥160
Temperature (°C)	Accumulated temperature greater than 10°C≥2000

platform and contact information, technical editors, foundation and the data sharing policy. Table 1 summarizes the main metadata elements of the MarginalLand_Asia_2010 dataset.

3 Methods

In order to obtain the distribution data of marginal land resources in Asia, a multiple factor analysis method was used based on integrating multiple datasets including remote sensing-derived land cover, terrain, meteorological data, soil and characteristics of bio-energy crops.

First, we collected the basic data related to the cultivation of bio-energy crops, including

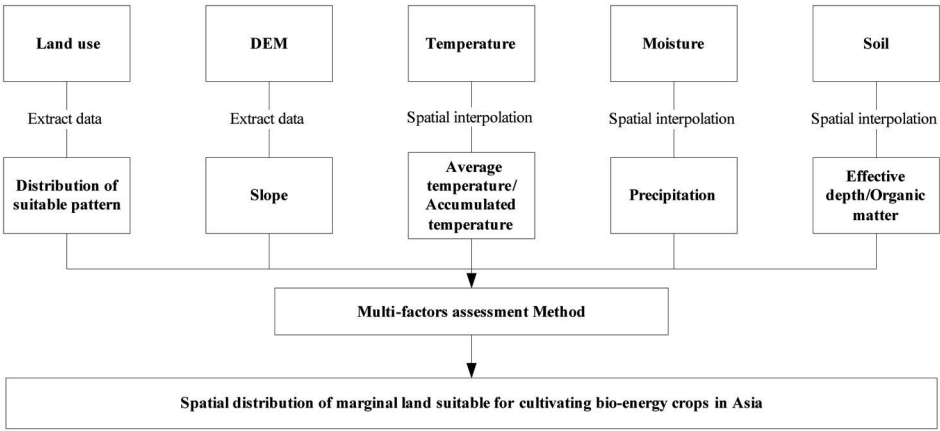


Figure 1 The flow chart of MarginalLand_Asia_2010 data development

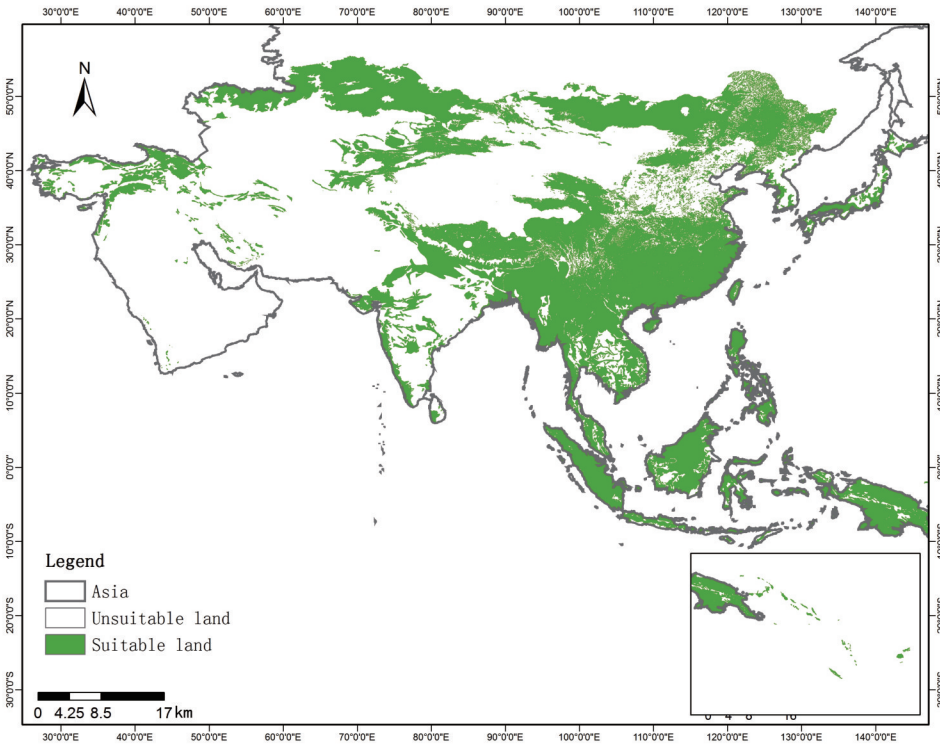


Figure 2 Map of suitability assessment data of marginal land resources for cultivating bio-energy crops of Asia

the land cover, temperature, soil depth, organic matter content and slope and resampled all data into the resolution of 1km. The data sources were listed in Table 2. Then, we determined the thresholding value of each factor according to the bio-energy crops growth demands for the environmental conditions (see Table 3). Finally, a multiple factor analysis method was used to identify the marginal land suitable resources for cultivating bio-energy crops by using the GIS technology^[5-6]. The specific procedures are presented in Figure 1 and the result in Figure 2.

4 Dataset product

This dataset is the suitability assessment data of marginal land resources for cultivating bio-energy crops of Asia in 2009 with 1 km² spatial resolution. The data size is 102 MB in ARCGIS GRID data format.

The area of marginal land suitable resources for cultivating bio- energy crops was calculated as 16.99 million km², based on the Lambert (Lambert conformal conic projection) projection with two standard parallels. The two standard parallels are 29°N and 37°N latitudes.

5 Dataset quality control and validation

The dataset has been validated in Wuhan Botanical Garden of the Chinese Academy of Sciences and South China Botanical Garden in China. The accuracies of the two areas are 87% and 85% respectively. The areas besides China haven't been validated yet. More detail of validation methodology has been published as reference 1 and 2.

6 Conclusion

This dataset is the preliminary research results of the suitability assessment of the marginal land resources for cultivating bio-energy crops in Asia with the spatial resolution of 1 km. It is useful data for further study in large- scale cultivation of energy plants and sustainable development of bioenergy.

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