A comparative analysis of five cropland datasets in Africa

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ABSTRACT:

The food security, particularly in Africa, is a challenge to be resolved. The cropland area and spatial distribution obtained from remote sensing imagery are vital information. In this paper, according to cropland area and spatial location, we compare five global cropland datasets including CCI Land Cover, GlobCover, MODIS Collection 5, GlobeLand30 and Unified Cropland in circa 2010 of Africa in terms of cropland area and spatial location. The accuracy of cropland area calculated from five datasets was analyzed compared with statistic data. Based on validation samples, the accuracies of spatial location for the five cropland products were assessed by error matrix. The results show that GlobeLand30 has the best fitness with the statistics, followed by MODIS Collection 5 and Unified Cropland, GlobCover and CCI Land Cover have the lower accuracies. For the accuracy of spatial location of cropland, GlobeLand30 reaches the highest accuracy, followed by Unified Cropland, MODIS Collection 5 and GlobCover, CCI Land Cover has the lowest accuracy. The spatial location accuracy of five datasets in the Csa with suitable farming condition is generally higher than in the Bsk.

1. INTRODUCTION

The extent, distribution characteristics of cropland are fundamental information which have long been identified as significant influences on global food security, climate change and environmental sustainable development (Jayne et al., 2014a). The food security particularly in Africa is still a challenge to humankind. It is estimated that food demand is expected to increase more than 60% in Africa by 2050 compared with 2005/2007, if the situation of cropland does not change, only few countries are able to be self-sufficiency (Martin et al., 2016a). The exact cropland area and spatial distribution are vital information to the study of food security which cannot be obtained by statistic data.

Because of the consistently and efficiently monitoring on temporal and spatial scale, Satellite data has becoming a major reference for cropland mapping (Russell et al., 2014a). Since 2000, global land cover datasets from high resolution satellite sensors have becoming popular. MODIS Collection 5 product made by Boston University was derived from the MODIS data of 2000-2012 with 500m spatial resolution (Friedl et al., 2010a). ESA (European Space Agency) produced the GlobCover land cover dataset of 2005 and 2009 with 300m resolution by using[1] MERIS (Medium Resolution Imaging Spectrometer) reflection data (Bicheron et al., 2008a; Bontemps et al., 2011a). Aiming to deal with climate issue in 21 century, CCI Land Cover was produced by ESA, based on MERISFR data and updated by SPOT-VGT data (Defourny et al., 2014a). Unified Cropland dataset with 250m resolution in circa 2014 was derived from existing global land cover maps (François et al., 2016a). NGCC (National Geomatics Center of China) produced GlobeLand30 dataset with 30m spatial resolution by using TM data and ETM+ data as basis and HJ-1 dataset as reference (Chen et al., 2015a).Varieties of satellite sensors, spatial resolutions, classification schemes and mapping technologies result in the difference between global land cover datasets (Pérez-Hoyos et al., 2012a). For product users and producers, clarifying the strengths and weaknesses of datasets is vital. In recent years, several researchers have compared the difference and consistency of global land cover datasets. Commonly existing methods for the comparison can be classified into two categories: assessing classification data derived from global land cover datasets according to the comparison with statistic data (Pérez-

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