Tropentag, September 20-22, 2017, Bonn

"Future Agriculture:
Socio-ecological transitions and bio-cultural shifts"

Remote Sensing Based Mapping of Crop Rotation Systems in the Sudanian Savannah of West Africa

Michael Thiel, Alejandra Narvaez Vallejo, Gerald Forkour, Michelle Uder, Christopher Conrad

University of Wuerzburg, Dept. of Remote Sensing, Germany

Abstract

West Africa is well known as a region with a very high poverty rate and high population growth. The region is also known to be highly vulnerable to climate change. Agriculture still is a main source of income in the Sudanian Savannah Zone of West Africa where about 60–80 % of the population lives from subsistence farming. Major crops in the study region, composed of watersheds in Ghana, Burkina Faso and Benin, are cereals such as sorghum, millet, maize and rice. Cotton is widely grown as a cash crop. In the past, farmers practised rotational farming including fallow periods of about three to five years. Suitable land for farming becomes rare due to land degradation and population growth. Consequently, fallow periods decreased or agricultural areas are constantly used with negative effects on soil fertility and yields. Crop rotation and intercropping, the latter defined as the growth of different crops on the same field, are known as adaptation strategies to land pressure and yield insecurity. However, the spatial distribution and appearance of these cropping systems is unknown in the region. Remote Sensing provides the data and methodological framework to derive such information. We mapped land use /land cover on 5 m geometric resolution during three consecutive years from 2013–2015 using a multi-sensor, multi-temporal non-parametric classification scheme. The classification includes crop types on a field base and covers three watersheds within the region. Since Remote Sensing mapping is always accompanied by errors, this study focuses on the analysis to which extend the combination of maps of the three consecutive years allow the delineation of crop-rotation systems. Therefore, we applied post-classification change detection on pixel and field base and compared the results with ground-truth survey and questionnaire data. Results showed that crop rotations could be mapped with an accuracy of 60 % – 77 %. Crop rotations can be found throughout the area, while the huge number of intercropped fields hinder the detection of the crop rotations especially close to settlements.

Keywords: Crop rotation systems, multi-sensor, remote sensing, West Africa

Contact Address: Michael Thiel, University of Wuerzburg, Dept. of Remote Sensing, Oswald-Kuelpe-Weg 86, 97074 Wuerzburg, Germany, e-mail: michael.thiel@uni-wuerzburg.de