

# **Estimating Spatial Distribution of Biomass Changes in Inner Mongolia Grassland by Satellite Images**

Zhe GONG<sup>\*1</sup>, Kensuke KAWAMURA<sup>1</sup>, Naoto ISHIKAWA<sup>2</sup>, Masakazu GOTO<sup>3</sup>,  
WULANTUYA<sup>4</sup> and Jin HAI<sup>5</sup>

<sup>1</sup> *Graduate Student, Associate Professor, Graduate School for International Development and Cooperation, Hiroshima University, 1-5-1 Kagamiyama, Higashi-Hiroshima 739-8529, Japan Tel: +81-82-424-6929; E-mail: [gongzhe79@gmail.com](mailto:gongzhe79@gmail.com); [kamuken@hiroshima-u.ac.jp](mailto:kamuken@hiroshima-u.ac.jp)*

<sup>2</sup> *Assistant Professor, Faculty of Life and Environmental Sciences, University of Tsukuba, 1-1-1 Tennoudai, Tsukuba, Ibaraki 305-8572, Japan Tel: +81-29-853-6686; Email: [ishikawa.naoto.ke@u.tsukuba.ac.jp](mailto:ishikawa.naoto.ke@u.tsukuba.ac.jp)*

<sup>3</sup> *Professor, Faculty of Bioresources, Mie University, 1577 Kurimamachiya-cho, Tsu, Mie 514-8507, Japan Tel: +81-59-231-9494; Email: [goto@bio.mie-u.ac.jp](mailto:goto@bio.mie-u.ac.jp)*

<sup>4</sup> *Researcher, Rangeland Survey and Design Institute of Inner Mongolia, Huhhot, Inner Mongolia 010051, China Tel: +86-471-6508620; Email: [wulantuyanm@yahoo.co.jp](mailto:wulantuyanm@yahoo.co.jp)*

<sup>5</sup> *Professor, Inner Mongolia Autonomous Region Academy of Agricultural and Stockbreeding Sciences, No. 22 Zhao Jun Road, yuQuan District, Huhhot, Inner Mongolia 010031, China Tel: +86-332-7127873; Email: [huhehao@yahoo.co.jp](mailto:huhehao@yahoo.co.jp)*

**Abstract:** Inner Mongolia grassland, one of the most important grazing regions in China, has long been suffering a serious threat of land degradation, and even desertification, mainly due to overgrazing. This study examined changes of spatial distribution of above-ground biomass (BM) for whole regions of Inner Mongolia grassland by applying time series Terra MODIS images during 2002-2012. The BM data was obtained from 3 different sites (Meadow, Typical and Desert steppe) where located Wulagai, Xilingol and Siziwangqi, respectively. The plant samplings made every 2 weeks during growing season (April-September) in 2011 for inside ( $n = 40$ ) and outside ( $n = 40$ ) of protect cages. The corresponding 16-day composite vegetation indices (VIs) of normalized difference vegetation index (NDVI) and enhanced vegetation index (EVI) were used to regress with BM data. An advanced Savitzky-Golay filter was applied to reconstruct the VIs time-series. In the results, the highest coefficient of correlation ( $R^2$ ) and the lowest root mean squares error (RMSE) values were obtained in the NDVI with linear regression model ( $R^2 = 0.576$  and  $RMSE = 71.77\text{g m}^{-2}$ ). Although the results showed uneven spatial distribution of BM,

the mean value displayed a positive trend in last decade (2002~2012).

Keyword: Above Ground Biomass, Inner Mongolia, Land Degradation, MODIS, Savitzky-Golay