A Model-Based Approach for Mapping Rangeland Cover Using Landsat-TM Image Data

Majid Ajorlo
University Putra Malaysia, Malaysia

Ramdzani B. Abdullah
University Putra Malaysia, Malaysia

The 21st International Grassland Congress / 8th International Rangeland Congress took place in Hohhot, China from June 29 through July 5, 2008.

Proceedings edited by Organizing Committee of 2008 IGC/IRC Conference

Published by Guangdong People's Publishing House

A model-based approach for mapping rangeland cover using landsat-TM image data

Majid Ajorlo and Ramdzani B . Abdullah
Faculty of Environmental Studies , University Putra Malaysia , 43400 (UPM) , Serdang , Selangor D .E . , Malaysia .E-mail : Ajorlo _ m54@ yahoo .com

Key words : biophysical variables , Iran , landsat-TM , multiple regression , rangeland

Introduction Empirical models are important tools for relating field-measured biophysical variables to remote sensing data . Regression analysis has been a popular empirical method of linking these two types of data to estimate variables such as percent vegetation canopy cover , and bare soil . The goal of this study is to find a relationship between Landsat-TM original data from single date image and rangeland biophysical variables using multiple regression modeling .

Materials and methods This study was conducted in semi-arid rangelands of Kolanjin River Basin , 120 km west of Qazvin city (35° 24′ 16″to 35°38′26″N latitude and 49° 24′48″ to 49° 31′ 48″ E longitude) . Total area of study site is 17654 ha . Average annual precipitation is 345 mm over the past 30 years .

Field measurements of land cover attributes were taken within a month of the satellite image data acquisition . Vegetation cover , gravel and stone , and bare soil extent as biophysical variables were measured during field survey . Stepwise multiple regression was used to develop the most appropriate statistical models for prediction of rangeland cover based on ground based data and landsat-TM image data . In the given dataset independent variables which have had high significant correlation with dependent variables (field data) were recognized . Ultimately separate regression models were developed for all variables . Then , regression models were applied to produce vegetation cover , stone & gravel , and bare soil extent maps of rangelands . Validation of the model was done using the 20 transects measurement not used in the model development .

Results and discussion The results of applying stepwise multiple regression showed that there is a significant correlation between Landsat TM band 2 reflectance values and field data . There were no significant correlations between other bands and field data . Regression models were produced according to the output of regression analyses and were applied only on rangelands in Landsat TM band 2 . The relevant maps were generated for vegetation cover , gravel & stone , and bare soil extent . Preliminary validation of the models in this study suggests that multiple regression is a nonrobust technique for finding relationship between original data of Landsat-TM and rangeland biophysical variables .

We observed some problems such as small size of samples , low number of samples , and sampling on the specific areas are main reasons of producing nonrobust models . Fitzpatrick and Megan (1994) noted that when we use regression analysis to find a relationship , sampling must include the entire range of vegetation cover changes (sparse to dense) . Field sampling is based on limited discrete sampling over a continuous spatial dimension . This leads to a blind extrapolation when information concerning unsampled areas is requested . Models were based on a relatively low number of plots , which were perhaps not sufficient to characterize all environmental conditions .

Conclusions We concluded that such problems as an inexact location of field samples on the image , small size of samples , low number of samples , sampling on the specific areas , vegetation heterogeneity may significantly affect modeling of real rangeland-Landsat-TM relationships . If we overcome to these problems , better correlations would be expected (as models would be more widely predictive) .

References

Cohen , B . W . , Thomas , K . M . , Gower , S . T . , Turner P . D . , (2003) . An improved strategy for regression of biophysical Variables and Landsat ETM+ data . *Remote Sensing of Environment* 84 , 561-571 .

Fitzpatrick , B . , Megan , A . , (1994) . Relationship between vegetation cover field data and Landsat-TM in the pasture development areas of the Douglas-Daily Basin , Northern territory . In : 7th *Australian Remote Sensing Conference Proceedings* , Melbourne , Australia .