Mongolian Journal of Biological Sciences 2003 Vol. 1(2): 25-32

Time–series Satellite Data Analysis for Assessment of Vegetation Cover in Mongolia

Naidansuren Erdenesaikhan

Environ LLC., Bayanzurkh district, XII Micro-district,Bldg.1-11, Ulaanbaatar, Mongolia
e-mail: Erdes@environ.mn

Abstract

Vegetation cover and its dynamics and trends are of interest for many: starting from herders, crop farmers and wildlife managers to decision makers, planners and wide profile of scientists. Discussed here is an attempt to assess the vegetation temporal dynamics using time series NOAA satellite 1 km data that cover the territory of Mongolia in the period of 1989 – 2002. Normalized Differences Vegetation Index (NDVI) and Departure from Average methods were employed to assess the vegetation cover status and its changes and trends over 14 years. The author has used raw data from the NOAA satellite active archive for this study and processed through Erdas Imagine and ArcGIS software packages. This study can be useful tool for land, pasture, wildlife managers and others interested in vegetation cover changes over vast areas of Mongolia and valuable in case where lack of vegetation data.

Key words: Vegetation cover, satellite data, NDVI, departure from average

Introduction

Mongolia is a land-locked country located in Central Asia between Russia and China. The climate is continental with harsh winters and hot, short summers. The total population of Mongolia is 2.3 million with an area of 1.565 million sq. km, making it one of the lowest population density areas (1.5 persons per sq. km) in the world. The main economy is nomadic animal husbandry with 33.4% GDP. Of the work force, 48.6% is in the livestock-breeding sector. Until 1990, Mongolia had a central economy with state owned farms of cattle, sheep, goat, camels and horses. There were also state-supported monitoring systems for livestock production, water supply and pasture quality. After 1990 Mongolia shifted towards a market-economy, privatization took place for much of the state owned properties and former structures for monitoring failed to function effectively. Privatization has stimulated the livestock industry, which has reached its maximum and pastureland has approached its maximum carrying capacity (Erdenebaatar *et al*., 2001). Recent extreme climate variations and pastureland deterioration brought waves of problems in this sector: high livestock mortality; decrease in pasture productivity; increase in livestock disease and as a result, a dramatic decrease in lifestyle quality for herders' families. Currently, livestock managers need accurate and timely data on vegetation conditions in their pasturelands (Tserendash, 2000). Despite the constitution statement of the country that "livestock is under care of the state" the government is not able to provide essential information for herders to assist them in ways of sustainable livestock breeding. It is very time-consuming and expensive to use ground measurements in a repetitive manner to assess pastureland productivity and quality over vast areas, which makes it unaffordable for the central and local governments as well as the individuals.

Remote Sensing for Pasture Management

The time–series information about location and condition of the vegetation of pasture areas is one of the key elements for effective management of pastoral (extensive) livestock production. Remotely sensed data derived from satellites have successfully been used for decades in assessment of pastureland productivity, predicting biomass and monitoring vegetation health status (Reeves, 2001) in temporal and spatial scales and proved to be economically feasible measurements (Tueller, 1989).

Many researchers have studied vegetation growth and its productivity in two different directions. One is to establish empirical