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# Evaluate the interactions between grassland ecosystems and precipitation anomalies under changing grazing intensity in Central Asia

**Dildora Aralova[1]*, Babatunde A. Osunmadewa[1], Toderich Kristina[2], Dilshod Gafurov[3], Elmar Csaplovics[1]**
[1]Institute of Photogrammetry and Remote Sensing, Technical University of Dresden, Germany
[2]International Center of Biosaline Agriculture, Tashkent, Uzbekistan
[3]Scientific research Institute for cotton breeding, seeding and cultivation agro-technologies, Kibray, Uzbekistan
*Corresponding author e-mail: aralovad@gmail.com

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## Introduction

Long term monitoring of grassland being the largest ecosystem on earth plays an important role in understanding its productivity and transformation (changes) over time. With the availability of remote sensing data, most ecological and environmental problems caused either by human activities such as extensive agriculture, pastoralism which might lead to desertification, land degradation, loss of biodiversity and climate change amongst others can be monitored. For this study, vegetation cover was selected as the main source of examination and subsets of area covered with grasslands were profiled for further monitoring of grassland increasing and decreasing trends in selected areas of Central Asia.

## Materials and Methods

The aim of this paper to estimate grassland ecosystems on the base of multi-annual trends of spatial and temporal changes in vegetation cover for the last three decades under different land cover category especially for grassland ecosystems. The approach used in this study was based on seasonal trend analysis of vegetation greenness in the whole Central Asia using Advanced Very High Resolution Radiometer (AVHRR) data from 1981-2011 with a spatial resolution of 8km (GIMMS, bi-monthly NDVI3g). GLCF 2000 (1 km) and GlobCover 2009 (300 m) was used for the estimation of areas covered with grasslands in the Central Asian steppe, meadow and grassland zones. Three step methods were involved in the analysis, in the first stage, the bi-monthly NDVI 3g dataset were aggregated to a monthly composite to reduce the effect of noise and STA was applied to the monthly composite NDVI 3g data. The STA analysis is a two stage approaches, in the first stage, harmonic regression was performed on the NDVI time series to extract the greenness sequence of the year (amplitude and phase). Where amplitude 0 represents the overall greenness, amplitude 1 the peak of annual greenness and phase 1 timing of annual peak of greenness. In stage two of the STA, temporal trend in the greenness parameter was calculated based on Theil- Sen slope procedure. Step three of examines the existence of serial correlation in the NDVI time series data, this was done using the Contextual Mann-Kendall method to analyze the significance of each pixel. Visual observation of the image produced from the harmonic regression analysis was examined at specific locations in Central Asia specifically in grassland area to further understand the greenness pattern over time as presented in the NDVI data.

## Results and Discussion

Since the interest is to examine the seasonal trend analysis of grasslands in Central Asia especially for steppes and meadow zones and their trends with vegetation and rainfall dynamics under last three decades. The findings suggest to decrease of areas grasslands especially southern part and expecting less rainfall is also negatively effected in these drylands. Monitoring of seasonal variations of vegetation (greenness), in particular, ecological scales of vegetation have selected on the base of various plant communities for the period of 2000 and 2009, results shown is slightly changes in the last years, due to less rainfall and greeness index is less than expected results. Region of Interest (ROI) was designed with concrete and random orientation of plants with interpretation for sample size of points (dots) and selected based on ground truth data. A computerizing regression for spring and autumn seasons for driving the various factors influenced on plant biomass for different plant communities, as results phytoindication indicators were elaborated and designed for different ecological grassland zones in Central Kyzylkum.

**Conclusion**

The decline of vegetation in the last decades is sensitively attributable to the recent tendency towards in dry and harsher conditions as ecological factors like (wind erosion, dry and hot summer, high evaporation) associated drought stress especially for grassland ecosystems. Understanding the relationship between rainfall and seasonal trend analysis, also vegetation activity are an important requirement to estimate potential impacts of grassland productivity, due to climate change anomalies and impacts of this issue is more important aspect in stabilize land use and land cover.

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