Abstract

The overall of the project is to investigate and monitor land degradation and desertification processes by using Remote Sensing and Geography Information System (GIS) techniques. It is the first attempt to conduct a land degradation research in the Tillabéry area (Niger republic). This opens up a new field, combining statistical and non-statistical (rather algorithmic) methods for the investigation and analysis of any unknown landscape by using geoscientific methods, specifically GIS. The evaluation of land use /land cover were carried out from classification of one Landsat Multispectral Scanner (1973-09-30), one Landsat Enhanced Thematic Mapper plus (2001-09-18) and two Landsat Thematic Mapper (1989-09-29 and 2007-09-27) subscenes of about 312345 ha.

This work was of interest to an amount, trajectory and velocity(rate) of change basic of Landscat images using thematic change detection method .The results illustrate the amount of negative change from 1973-1989; 1973-2001; 1973 -2007; 1989-2001; 1989-2007 and 2001-2007 respectively of 29%, 35.17%, 43.05%, 34.45%, 39.55% and 35.08% of the study area . The northern part of the study area shows drastic changes in vegetation cover whereas the area around the Niger River highlights more stable vegetation .Increases of bare areas, wadi, and agricultural fields constitutes the major dominant change in the study area. The conversion from shrubs or grassland to bare areas is obviously indicating deterioration and hence considered in this work as high risk (16%). The medium risk cover 23% is the conversion from shrubs to grassland or agricultural land. Although the medium risk is protected by grass and crop cover, it still is endangered by erosion or improper use. The low risk (55%) constitutes the area with desirable or positive amount of change and that has remained intake

In this study, the usefulness of landscape structure was investigated in the context of desertification. A set of indices was selected to investigate multitemporal change in Tillabery landscape affected by desertification development. The percentage of landcape indices shows a decrease of plateau vegetation (54.78% in 1973, 20.11%

in 1989, 18.07%in 2001 and 11.87% in 2007) and water (5.98%.in 1989, and 2.34 in 2001).Also these indices show an increase of bare soil. The shrubs increase (22.78% in 1973 and 29.34% in 1989) caused by greater planting activities and increasing of precipitation during 1988 and 1989. The Tillabery landscape has a large number of patches with smaller patch size, indicating that the original landscape has been gradually converting into bare area and agricultural fields and the land degradation in the region is serious. Patch richness (PR) increased during the study period caused by increasing of landscape elements, which means the decreasing of biodiversity as well as nutrient storage (soil degradation) and storm water retention in the study areas. PR is an important component of diversity and has significant connotation for the diversity of animal and vegetation population within the landscape and also for the nutrients, movement of energy, and vegetation and animal species within the landscape. From the viewpoint of time series analysis, from 1973 to 2001 diversity and evenness become higher and higher; it indicates that the landscape heterogeneity and evenness increased and it attributes to the increasing of number of classes (richness). The evolution of landscape shape index (LSI) at the class level shows that the majority of elements LSI increased from 1973 to 2001. That means all patches become increasingly disaggregated in the process of desertification. On the contrary, LSI of all patches decreased continuously from 2001 to 2007, indicating that those patches become more aggregated.

An attempt has been developed for desertification index model. Based on this model, desertification has been categorized into five classes namely, no affect, low, moderate, severe, and highly severe classes. This is a hybrid index system of desertification bringing together the different relevant perspective and knowledge such as amount, trajectory, rate of change, diversity, fragmentation, soil erodibility, aspect, length/slope, relative moistures, land surface temperature, soil erosion estimation and physical deterioration of vegetation.