

## ***Interactive comment on “Assessment and Monitoring of Land Degradation Using Geospatial Technology in Bathinda District, Punjab, India” by Naseer Ahmad and Puneeta Pandey***

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Review of research paper: se-2016-172 “ Assessment and Monitoring of Land Degradation Using Geospatial Technology in Bathinda District, Punjab, India”

This study aim to integrate remote sensing data and field-based soil data to assess severity of land degradation in the Bathinda District, Punjab. The authors selected multispectral Landsat 7 and 8 images for 2000 and 2014 to conduct a land use and land cover change of the study area. Next, soil data analysed for three physico-chemical parameters of soil quality (i.e pH, EC and Alkalinity) collected from 21 sites within the study area were correlated with remotely sensed data, particularly band 5 of the pixels. For me, the images were well processed and the result of Land use/land cover

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change is commendable. Without any iota of doubt, the study represents a great effort on the part of the authors to use geospatial technology in natural resource management. Great work. However, the paper needs some improvements before being recommended for publication. I therefore, listed specific areas that require authors attention as follows:

Title: I considered the title ok. Abstract: The abstract is well written. However page 1, line 8 , how was severity measured in this study. This should be defined in quantitative term and should be mentioned in the abstract. The abstract is a synopsis of the whole research. Introduction The introduction needs improvement. Start with line 27 and move lines 23-26 to other part of the introduction. The title suggests that we are dealing with land degradation and not land use/land cover change per se. This should reflect in the introduction. What is the gap in knowledge and how does this paper fill that gap? Is the contribution of this paper to knowledge in term of methodology or what? Having gone through the whole paper, I guess the major issue is in the area of methodology. (i.e Integration of remotely sensed data with field based data to determine the severity of land degradation). This can be included in the introduction Study Area Detailed description of the research context is required at this stage, particularly to help readers who are not familiar with the study area. Figure 1 as indicated in the paper now is on data collection issues and not the study area per se. The location map needs to show the location of Bathinda District, Punjab, in relation to India. The main map should be Bathinda District, and the smaller map should be India. The location map is meant to orientate the reader. Methodology Data collection and analysis What informed the choice of Land Sat 7 and 8 images used and the year selected? Please discuss? I see that the soil samples were analysed for chemical properties only, and not physico-chemical soil properties. Why only three soil quality parameters? One would have expected that more soil quality parameters be included in the analysis. Here, I suggest that textural properties as well. Next, why 21 soil sample points? Was this a function of cost or time? Please argue this out . Also give the coordinates of the sample points in table 5. Data Analysis To me, there is a confusion on the table of cor-

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relation. It is important to clarify whether DN used in the correlation matrix is the same as values of band 5 (Near infrared band) of the pixels for 2014 image. The correlation analysis needs to be tested statistically at 0.5 level of significance. The significance of the correlation coefficients between DN/pH; EC/pH, DN/EC should be tested for significance here. Result and discussion Page 21 line 15-17 “Mehrijardi et al. (2008) proved that correlation between digital numbers of satellite images and soil salinity could be an efficient parameter for assessing the land degradation by preparing soil salinity maps from remotely sensed data” . A fundamental issue that I think is lacking in this paper, and which I believe readers of this work would like to see is a map shown the severity of land degradation. This is missing and can be done within the GIS environment using geostatistical analyst in Arc GIS. This appears to be the missing link in the paper and should be included in the revised version of the paper. There are several methods to do this. The authors may want to use any of the known interpolation methods. Kriging may be a good method to estimate the variable (salinity) over space. Then, check the validity of the model using the analysis of variance with the related error means and the mean square of error. ARCMAP can be effectively used to analyze the spatial structure of the data and to define the semivariograms. See the following: 1. Burgess, T. M., and R. Webster. 1980. Optimal interpolation and isarithmic mapping of soil properties: The variogram and punctual kriging. *Journal of Soil Science* 31:315–331 2. Alejandra Mora-Vallejo et. Al 2008 Small scale digital soil mapping in Southeastern Kenya . *Catena* 76: 44-53 3. Behera, S.K and Shukla, A K ( 2014) Spatial Distribution of Surface Soil Acidity, Electrical Conductivity, Soil Organic Carbon Content and Exchangeable Potassium, Calcium and Magnesium in Some Cropped Acid Soils of India Land degradation and Development . DOI: 10.1002/ldr.2306

4. Sheng et al (2010) Digital soil mapping to enable classification of the salt-affected soils in desert agro-ecological zones *Agricultural Water Management* 97: 1944–1951

General Impression: Presently, the paper focuses more on the analysis of land use and land cover change (LULC) in Bathinda District, Punjab, India. This is the strength of the

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paper for now and efforts of the authors commendable. However, the issue of severity of land degradation has been glossed over. Severity of land degradation should be shown in quantitative terms within the GIS environment. I hope I have provided suggestions that could be used to improve the quality of this paper. Based on the above observations, I wish congratulate the authors for good job and also recommend a major revision on this paper before publication.

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