**Response to Reviewer 1 comment**

**Comments and Suggestions for Authors**

The manuscript entitled “Determination of Mehlich 3 extractable elements with visible 2 and near-infrared spectroscopy in a mountainous agricultural 3 land, the Caucasus Mountains” is scientifically interesting and original.

However, there are some important issues that need to be addressed:

The novelty of the study should be clearly stated in the Introduction section after the objectives are formulated.

Response: We would like to thank you for your valuable comments and directions. We have carefully considered all issues and have revised the manuscript completely (e.g. separation of section and subheadings, revising all the text, adding paragraphs and references, adding or changing Tables and Figures):

1) Abstract was revised.

2) Introduction was revised, and 2 new paragraphs were added. Such modification leaded to the clear description of the objectives.

3) Material and Method section was revised. Revised version contains 5 subheading.

4) The results and discussion sections were separated, and their subheadings were reorganized. In the revised manuscript the Results contain 5 subheading and Discussion contain 3subheading.

5) Presentation of the results are improved with consideration of reviewers’ comments.

a). Original Manuscript contained 3 Tables and 3 Figures. Revised manuscript contains 4 Tables and 5 Figures and 1 supplementary table and 1 supplementary figure.

b). New subheading (3.2. Land use effect on soil properties) was added. It contains new Table 2, Supplementary Table 1 and Supplementary Figure 1.

c). New Table 4 and Figure 4 were added. Table 4 is related to partial correlation analysis with consideration of soil properties, and Figure 4 is related to the principal component analysis (biplot).

d). Clarification: Table 1 and Table 3 were not changed. Old Table 2 is new Figure 2. Old Figure 2 is new Figure 3. Old Figure 3 is new Figure 5.

6) Discussion with new 3 subheading was significantly expanded and linked to the references and the novelty was highlighted.

7) Conclusions of the study was modified to show its practical outcomes for the local and international readers.

8) New 12 references were added to update the manuscript to address reviewers’ comments.

Due to the separating the Results and Discussion section, overlapping of some comments made by the reviewers and associated changes modified all the text of the manuscript was modified. Thus, to avoid possible confusion we provided the location (subheading or line) for any change introduced. Our point-to-point response to the comments of the reviewers is detailed below. Subheading or line numbers refer to the line numbers in the revised manuscript.

Two version of the manuscript was uploaded: edited main manuscript (with track change), and edited main manuscript (clear).

**“Materials & Method" section:**

a) There is not adequate information regarding quality control of the chemical analyses. Authors should report the detection limits and the recovery of the analytic methods used, along with and the standard solutions for the calibration of the instruments.

Response: Thanks. The section was revised and information regarding solution standards and detection limit was added. (M&M. subheading 2.2). Chemical analyses and descriptive statistics of the results

b) It is necessary to explain the method of sampling using the appropriate literature. Is the number of samples sufficient for the purpose of the research? Please explain.

Response: Thanks. The sampling scheme was explained as recommended (M&M, subheading 2.1). In general, sampling scale changes between 1:12 000 and 1:250 000 (Soil Survey Staff, USDA NRCS 2016).

In this pioneering study area, soil properties are highly variable attributed to topography, land use history and land tenure ownerships (mainly 0.2-0.3 hectares and fragmented shrubbery areas) and geological setting that makes difficult to apply regular sampling scheme. Therefore, the sampling locations were randomly (irregularly) designated, yet cover variations in land use, topography, geological substrate and the erosive state of soil continuum thereby resulted in 114 samples from 525 ha used under four land use types (1 sample per ~ 5 hectares).

c) Lines 125-135: There should be bibliographic references for the specific methods and their official name should be mentioned. Reference to formal analytical methods must be made in a scientific manner. The writing language used must be different from the way an analyst mentions it in the lab.

Response: Thanks. Two references were added. (Subheading 2.1)

The “Conclusions section” is not very successful concerning the presentation of results. It should be revised and rewritten in a way showing that the results of this study could be generalized in order to be interesting for an international audience.

Response: Thanks. Conclusions of the study was modified to show its practical outcomes for the local and international readers

The “Introduction section” should be reworked, highlighting the relevance of this topic worldwide. It would be wise to give more international flavor in the sections of Introduction and Discussion.

Response: Thanks. As mentioned above, we restructured the introduction section and included new paragraphs to illuminate the importance of the study. Special focus was given to clarifying prediction mechanisms for the studied soil properties and land use effect on soil properties.

In addition, it needs support with more and more up-to-date recent articles. I suggest the following:

* Soil parameters affecting the levels of potentially harmful metals in Thessaly area, Greece: a robust quadratic regression approach of soil pollution prediction, Environmental Science and Pollution Research, https://doi.org/10.1007/s11356-021-14673-0

Response: Thanks. The suggested study was reviewed and included to the reference list. It helped us to explain the results of our study (e.g. prediction of Fe and Cd using basic soil properties, clay mineralogy and (soil type) and micro-nutrients).