Assessment of Soil Properties using GIS Technologies in Selected Area in Myanmar

Hla Moe Khaing

Abstract A study was aimed to evaluate the selected soil properties and mapping under different cropping patterns of Sipintharyar village, Zeyarthiri Township, Myanmar. A total of 130 soil samples were collected from 0-20 cm depth using a Global Positioning System. Soil fertility maps were created using Kriging interpolation in ArcGIS software 10.5. Soil textures were loam, loamy sand, clay loam and sandy loam, respectively. The soils were strongly acidic to moderately alkaline and contained a very low status of soil organic matter (84%), available potassium (89%) while total nitrogen was medium (56.92%) level. Coefficient of variation (CV) showed that soil pH was the least variable (9.91%) with mean values ranging from 4.95 to 8.47 while available potassium was the highly variable (86.95%) with content values ranging from 1 to 578 ppm. Other selected properties such as bulk density, total nitrogen, CN ratio, electrical conductivity and soil organic matter were found to be most variable, 11.68%, 33.84%, 34.86%, 72.23% and 52.07%, respectively. Soil organic matter is highly significant and positively correlated with total nitrogen and available potassium. These variations in soil properties were probably related to the different cropping patterns and fertility management practices in the study area.

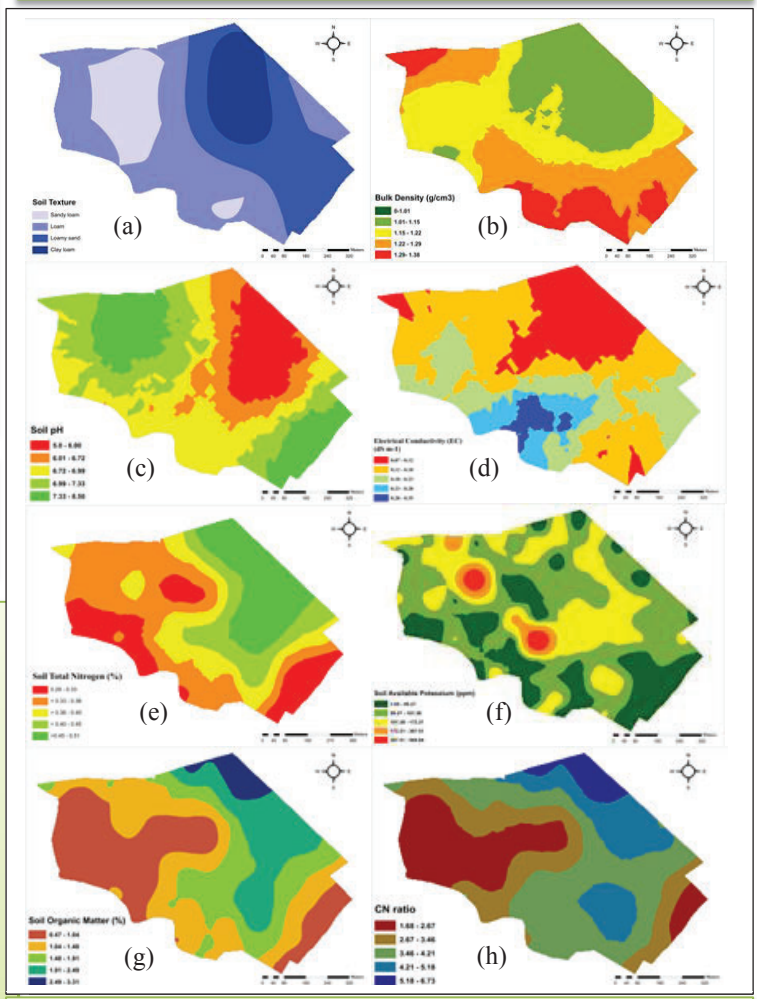
Keywords Soil properties, Global Positioning System, Arc GIS

Introduction: Agriculture sector in Myanmar accounted for 30% of gross domestic product, 60% of employment, 29% of value addition, and 23% of exports in 2016 (Agriculture Guide, Myanmar, 2018). In Myanmar, the major soil fertility issues are understood only at the higher level with limited information. Wakene and Heluf (2003) stated that the periodic evaluation of important soil properties and their responses to changes in land management is required to apply proper soil fertility management techniques, and to improve and conserve fertility and productivity of soil. Additionally, the spatial variability of soil fertility and its classification maps by applying GIS clearly show the specific locations of the areas, where attention is required with respect to management of plant nutrients (Jatav et al., 2013). Currently, there was little information on spatial variability of soil fertility parameters and very few efforts of generating soil fertility maps for agricultural soils in Myanmar.

Objectives: The objective is to evaluate the spatial variability of selected soil properties and mapping of soil fertility status under different cropping patterns of the study area.

Materials & Methods: Total study area is 60 ha and located at Sipintharyar village, Zeyarthiri Township, in central Myanmar. The grid map preparation was created using ArcGIS (Ver.10.5) software for the collection of soil samples in March 2020. The soil samples were collected after harvesting of crops from 300 m × 300 m grid points for soil texture and 75 m × 75 m for other soil parameters at 0-20 cm depth. Sixty farmers occupied in sample plots were selected and interviewed with structured questionnaire. Soil samples were analyzed by using standard methods in Laboratory of Soil and Water Science, Yezin Agricultural University. The soil results were analyzed by descriptive statistics using statistix (8th version). The coefficient of variation (CV) was classified for determination of nutrient variability according to Ogunkunle (1993). Nutrient index was calculated by Ramamoorthy and Bajaj (1969).

Results & Discussion: There is a large variation in soil properties in the study area. Electrical conductivity showed the highest variability with 72.23% CV, followed by soil organic matter, with a CV value of 52.07%. Least variability across sample areas was found for bulk density and soil pH, with CV values of 11.68% and 9.91% and moderate variability occurred for CN ratio (34.86%) and total nitrogen (33.84%). Spatial variability of soil properties were presented in (a) soil texture, (b) bulk density, (c) pH, (d) EC, (e) total nitrogen, (f) available potassium, (g) organic matter and (h) C:N.



Conclusion: Ranges of soil pH and EC should not be detrimental to the crop cultivation and the distribution TN were 50% in medium, 25% in low and 25% in high level, whereas most of SOM, CN ratio and AK were observed as in low levels. The NIV of TN and SOM was only medium level, CN ratio and AK were low levels. Farmers had been utilized nitrogen (urea) fertilizer regularly without applying single potassium fertilizer except manure and NPK compound in their crop management practice.