Spatial Variability Studies of Selected Soil Properties for Crops Land Management in Ellapamaruthankulam

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Introductıon and Objectives

Today sustainable agricultural practices play a vital role in the world because as the population is increasing, there is a need to provide ample amount of food to them. Therefore it is necessary to identify the most suitable agricultural land for the sustainable agriculture management. Soil properties vary spatially from a field to a larger regional scale affected by both intrinsic (soil forming factors) and extrinsic factors (soil management practices, fertilization, and crop rotation). The variation of soil properties should be monitored and quantified to understand the effects of land use and management systems on soils. Geostatistical methods have been used successfully for predicting spatial variability of soil properties and Ordinary Kriging (OK) is one of the most basic kriging method.

The objective of the study is to assess the spatial variability of some selected soil properties of crops land in Ellapamaruthankulam area, situated in Vavuniya DS Division, recommend the reclamation measures for problem soils and make suggestions to cultivate the crop variety which is suitable for the existing soil property.

Research Methods

The sampling area was 2.04 km2. Random sampling method was used to collect the soil samples for this research. Thirty soil sampling points were selected. Soil samples were collected from the top to 30 cm depth using core sampler. The sampling locations were recorded using Global Positioning System (GPS).

The collected soil samples were taken to the laboratory, air dried, crushed and sieved through the sieve of having 2mm mesh size. Cation Exchange capacity was determined by Ammonium extract method, pH was determined by 1:2.5 suspended method, EC was determined by 1: 5 suspended method, available nitrogen was determined by Kjeldal method, available phosphorus was determined by Olsen method and available potassium was determined by flame photometric method.

Geostatistical software (ArcGIS 10.2) was used to construct semivariograms and spatial structure analysis for the variables. Point map was created for cropland with measured value of each property. Then raster map was created. Then geostatistical estimation was done by ordinary kriging from raster. Select Lag interval, nugget, still, range as default value and cell size is 150m.

Results and Discussion

The entire land had high CEC and non-saline EC. Therefore, the effect of salinity is

negligible and the High CEC is normally good for agricultural soil. 89% of the land had neutral pH so they are most productive soils. 11% of the land had slightly acidic. This could be created by removal of bases by harvested crops, leaching, and an acid residual could have left in the soil from N fertilizers. As the evidence for this 71% of the crop land had high Nitrogen %which may be resulted due to high amount of fertilization of urea. So the acidic soil can be improved by adding lime or otherwise practicing cultivation like beans or other acid tolerant crop varieties such as beans, beetroot, sugarcane, cucumber, corn, tomato, pineapple and broccoli. But 29% of the crop land had optimum range of nitrogen %.

The entire land had a low phosphorus concentration and low potassium concentration. Low phosphorus concentration could be resulted due to inadequate fertilization or P reversion to fixed forms which is a larger factor than crop removal in depleting the extractable-P pool. Therefore, the low phosphorus concentration can be brought to an optimum level by addition of organic matter and adequate amount of phosphorus fertilizers. The low potassium content could be resulted due to inadequate fertilization of potash or the presence of Ca2+ in irrigation water and of soil minerals able to release Ca2+ are of importance in determining the amounts of K+ leached from soils. From 90 to 98% of the total potassium present in soils is found in insoluble primary minerals that are resistant to chemical breakdown. They release potassium slowly, but in small quantities compared to total needs of growing crops. Therefore, this field could be improved by addition of rice straw.

Conclusions

The study reveals major variability in terms of soil properties and soil nutrients status in the crops land in Ellapamaruthankulam area. Spatial maps showed, Ellapamaruthankulam area had high CEC, non-saline EC, low phosphorus and low potassium level. 89 % of the crops land had neutral pH and 71 % of the crops land had high Nitrogen %. Slightly acidic soils can be managed by application of liming materials and growing acid tolerant cultivars such as beans, beetroot, sugarcane, cucumber, corn, tomato, pineapple and broccoli. High Nitrogen % could be reduced by adding required amount of urea fertilizer. Low phosphorus level could be increased by addition of green manure and addition of most feasible P-fertilizer products such as Single Super Phosphate& Partially Acidulated P Rock and low potassium level could be increased by incorporation of rice straw and application of K fertilizers.

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