Bulk soil electrical conductivity as an estimator of nutrients in the maize cultivated land

Abstract

Methods of assessing soil nutrients under field condition are being developed worldwide. The concept of rapid assessment of soil nutrients is set to be used for precision farming in order to overcome the problems of delay in laboratory soil analysis and soil remedial action. The VerisEC 3100 sensor was introduced to rapidly measure bulk electrical conductivity (ECa) with the exact location using a Differential Global Positioning System (DGPS). This ECa relates to soil texture and other factors including salinity, which in turn affects nutrient use and mobility, and crop yield. This paper presents results on the use of ECa sensor in soil nutrient estimation and maize (Zea mays) yield production. The study was conducted at maize experimental plot of about 0.54 ha, sloping at about 7% from the highest point in the south to the lowest in the north. The sensor was pulled by a 85 HP tractor across the field with a swath of about 15 m. The ECa data were then transferred to ArcGIS for kriging map generation. Samples were collected at 3 points in the south, 3 points in the middle and 3 points in the north. The samples were analyzed for their chemical properties and physical properties. Maize yield and biomass were collected in 1x1 m grid for every soil sampling points. The data for those 9 sampling points were recorded. The lowest elevation has higher ECa values as compared to the highest elevation. It showed that available P, exchangeable K, clay, sand and maize dry weight at a maize cultivated land can be estimated by rapid soil ECa sensor. The ECas within the study area was mainly contributed by exchangeable K while, the ECad was contributed by available P, exchangeable K, clay and Mg. Biomass dry weight was contributed by available P, while maize dry weight was contributed by ECad.

Keyword: Soil; Electrical conductivity; Nutrient; Maize cultivated land