

Analysis and Evaluation of soil health and fertility status using R Programming for fertilizer recommendation of Rabi, Kharif and Summer Crops

Abstract

The main aim of this short research study is to address a problem with respect to soil health monitoring and evaluation of the fertility level for fertilizer recommendation for the crops and soils. This problem is anticipated to be solved by developing a soil health monitoring application using built in libraries and writing functions and scripts in R software. This application to be developed can be used also for exploration and investigation by the researchers and should be able to support teaching and learning activities with regard to soil analyses with respect to crops and fertilizer recommendations. This application will provide an index of nutrient availability [1] in a given soil specimen and also help plan a nutrient management initiative and a recommendation for fertilizer based on the fertility of the soil and requirement of the crop. In stage -I the soil data, crop data, season data and the soil nutrient content will be taken from government public repositories. The interpretation of soil chemical and physical examination will be done by the application developed in R, classifying the nutrient content and fertility level as very low, low, medium, high, or very high, as well as physical characterization driven by amount of clay content in the soil [2]. This will align with crop requirements based on location and climate condition. The parameters that are taken into consideration to monitor soil health(chemical and physical) are pH, Organic Carbon, Nitrogen (N₂O), Ammonical Nitrogen, Available Phosphorous (P₂O₅), Available Potassium (K₂O), Calcium(Free lime content CaO), Available Sulphur (SO₄-S) etc. The soil health monitoring framework is built around Fertilizer recommendation with respect to NKP Fertilizers. The application will take as input existing soil statistics and recommend below chemical elements in desired proportion for varied soil types and crops across three seasons. Even the wet weighted content will be evaluated using appropriate conversion. Using the R-programming package constituting of libraries, functions, and scripts developed the data handling will be faster. The functions in R will allow the user to calculate the analysis of the variance (ANOVA) table through a previously defined statistical model and multivariate analysis will be used to evaluate pearson correlation based on soil traits .The "raster" package will also be used for clustering the soil fertility traits and a variable will be assigned to the raster package using this visualization of the data can happen through the layout function. For example for FertilitySuit if the input value is a raster map, then the output will also be a raster map of fertility suitability for the crop of interest [9].The outputs will be accessible to improve teaching and learning activities and quick adoption. The second phase of this project will be a continuation with sensor based nutrient assessment and recommendation for different soil types.