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Assessment of soil quality and resilience in semiarid tropical region of India

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Subsistence agriculture under rainfed conditions and declining or stagnant yields on irrigated farmland has raised concerns about resource management and long-term sustainability in the subtropical, semiarid region of India. Soil quality assessment has been recognized as an important step toward understanding the effects of land management practices within an agro-ecosystem. A soil quality index (SQI) was determined for soils collected from different land use system of Nalgonda and Warangal District of Andhra Pradesh of India. Total 22 physical, chemical and biological properties of soil were analyzed for all the soil samples. The surface map of soil properties was prepared through ordinary kriging interpolation techniques using geostatistical tools of Arc-GIS software.

To determine the SQI, minimum data (MDS) of indicators were chosen using Principal component analysis as well as based on contribution of soil parameters to soil function through expert comments. The MDS were converted to score based on soil function and the indicator scores were integrated to an index of soil quality.

A multiple regression analysis showed that there was significant dependence between goal variable i.e., yield with SQI. Also there was good relationship (r^2=0.596) between two procedures of calculating SQI. Calculated SQIs resulted in the order of these land use systems: castor < Intercrop < Redgram < sorghum < cotton < maize < fallow < rice. Irrigated systems had better soil quality than areas where rainfed agriculture was practiced. Among the different soil order, Vertic Inceptisols and Vertisols had highest SQI followed by Inceptisols and Alfisols. A biological resilience of soils was also studied based on substrate induced respiration after heat stress. These results indicated that good soils having higher soil quality indices were also productive and have higher resilience capacity.

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Response of mustard (*Brassica juncea* (l.) czern and coss) to vermicompost and inorganic fertilizer in loamy sand soil

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A field experiment was conducted during *rabi* season: 2010-11 at Agronomy farm, College of agriculture, Bikaner (Rajasthan) to study the response of fortified vermicompost and sulphur on growth, yield and quality of mustard [*Brassica Juncea* (L.) Czern and Coss] grown on loamy sand soil. The experiment was laid out according to randomized block design with three replications. The treatments consisted of four levels of vermicompost (0, 2.0, 4.0 and 6.0 t ha^{-1}) and four levels of sulphur (0, 20, 40 and 60 kg ha^{-1}). Uniform application of recommended doses of nitrogen and phosphorus were applied along with vermicompost and sulphur in mustard, variety Bio-902 (Pusa jai kisan) grown on loamy sand soil. The main findings of investigation are summarized as: In surface soil (0-15 cm), an application of increasing levels of vermicompost significantly increased to the plant height, branches per plant, number of siliquae per plant, number of seeds per siliqua, test weight, seed and stover yield. Vermicompost application also increased significantly to the content and uptake of nitrogen, phosphorus, potassium and sulphur in seed and stover both. Protein content, oil content, oil yield and net return were also found significantly higher with the application of increasing levels of the vermicompost. Similarly, application of vermicompost also significantly increased to the organic carbon, available nitrogen, phosphorus, potassium and sulphur in soil at harvest. Similarly, increasing levels of sulphur application in soil significantly enhanced to the plant height, branches per plant, number of siliquae per plant, number of seeds per siliqua, test weight, seed and stover yield, content and uptake of nitrogen, phosphorus, potassium and sulphur in both seed and stover. Protein content, oil content, oil yield and net return were also increased significantly with the application of increasing levels of sulphur. In soil, sulphur application did not enhanced organic carbon and available potassium at harvest. Whereas, sulphur application significantly enhanced the available nitrogen, phosphorus and sulphur in the soil.

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