Annals of Arid Zone 59(1&2): 51-61, 2020

Soil Fertility Appraisal for Hot Arid Regions of Thar Desert, Rajasthan, India

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Received: February 2020

Abstract: Soil fertility assessment for hot arid regions of Thar Desert in the Indian state of Rajasthan was carried out and on the basis of fertility ratings the soils were classified as low, medium and high. In the present assessment a systematic set of 5655 geo-referenced soil samples across the land use systems viz. rainfed croplands, irrigated croplands and rangelands covering 12 districts of hot arid Rajasthan were collected. The soil samples were analyzed for pH, EC, soil organic carbon (SOC), available P, available K, available Fe, Zn Cu, and Mn. Results of the soil analysis revealed that SOC is low throughout the region, while available P was low to medium, but generally medium to high in available K. Among the micronutrients Cu and Mn were adequately supplied in most areas, but Zn and Fe were inadequate in large parts. As a whole, SOC, P, Fe and Zn are the major nutrients constraint in hot arid regions of Rajasthan that warrants the attention for development and implementation of soil test based nutrient management plans and application of corresponding nutrients. The Nutrient Index Values (NIV) was low for available P (1.61) and medium for available K (2.14). Amongst the micronutrients NIV for DTPA Zn (1.51) was low, marginal for Fe (1.67), adequate for Cu (2.14) and high for Mn (2.47). The wide spread deficiencies of P, Fe and Zn were most revealing; their deficiencies varies with districts and land use pattern. Irrigated croplands were better endowed than other land uses in respect of SOC, P, Zn and Cu; rangelands in respect of K and Fe, and rainfed croplands in respect of Mn.

Key words: Hot arid Rajasthan, major nutrients, micro-nutrients, deficiency, nutrient index value.

Soil fertility management assumes great significance and constitute one of the important key inputs for achieving high productivity. Soil fertility status information helps to relate nutrient requirement with crop demand and thus conserve the resources. By characterization of the soils one can clearly understand the inherent capacity of soils for crop production as well as problems that arises in successful management of such soils for achieving higher crop production. Soils of India exhibits widespread deficiencies of nutrients like N, P, K, S, Zn, Fe and B (Muralidharudu *et al.*, 2011; Shukla and Tiwari, 2014). The pace of soil fertility depletion due to excessive nutrient mining coupled with continuous neglect of the plant nutrients replenishment have been reported with increasing frequencies in intensive agricultural production system. In the hot arid Rajasthan, the soils are usually sandy, deficient in several major and micro-nutrients, and there is large spatial variability in the plant available nutrients content of the soils (Gupta *et al.*, 2000; Praveen-Kumar *et al.*, 2009; Kumar *et al.*, 2019). Further, the soils of the region do not receive adequate nutrient replenishment through fertilizers and organic manures. Consequently, productivity of the soils in arid region is also relatively low. Ever since the production and productivity of crops in hot arid regions of India have become lucrative from commercial point of view, the pressure on the region's soil resources and the concern for fertility status of the soil have increased. Since the 1970s, however, demand from these soils started to increase manifold as Green Revolution and innovations in agricultural practices triggered large-scale expansion of irrigated cropping, especially after groundwater exploration encouraged the spread of energized wells. These developments turned many erstwhile rain-fed croplands into double-cropped lands, and also expanded the irrigated croplands into open rangelands and otherwise non-agricultural lands with meagre input of major and micronutrients. Such indiscriminate use of fertilizer nutrients not only aggravated fertility depletion but also

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