Plant Nutrient Contamination of Shallow-Groundwater in Intensive Vegetable Gardens of Nuwara Eliya

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The up country region of Sri Lanka is considered very important with respect to water resources. Suitable climatic conditions prevailing in the up-country and higher returns lead to year around cultivation of exotic vegetables and potato in a very intensive manner. Deterioration of soils and water resources are inevitable with over and improper application of plant nutrients to the cropping fields in this region. A study was conducted taking Katumanna as a representative location for intensive vegetable and potato cultivation in the region to evaluate plant nutrient contamination of shallow-groundwater, and to correlate shallow-groundwater nutrient contaminations with soil nutrient contents. The catena selected was divided into five slope positions. The upper-most position was a virgin forest while the other four positions were under intensive cultivation. Water samples were collected from 11 wells selected to represent shallow-groundwater, in two weeks intervals for 18 months during July, 2003 to December, 2004. Water samples were analyzed for NO₃⁻-N, NH₄⁺-N, K, Ca, Mg P, pH and EC. Soil samples were also collected from each slope position, during five cropping events (duration for a given crop) and analysed for pH, EC, total N, available P, exchangeable K, Ca and Mg.

EC, concentration of basic cations and NO_3^-N of the well water showed higher values in the cropped fields, whereas much lower values were recorded in the virgin forest. However, NO_3^-N concentrations of well water in cultivated lands in the lower slopes were higher than the virgin forest and were 2 - 3 times higher than the WHO standards (10 mgL⁻¹). NH_4^+-N showed low values in the forest as well as in the cropping lands. None of the cropping events showed significant differences related to nutrients in water. Cultivated soils of the studied area showed enrichment of N, P, K, Ca and Mg. Positive correlations were observed for Ca, K, Mg, and EC values of soil with shallow-ground water. Plant nutrient increments in the shallow-groundwater could be due to the application of high doses of fertilizers and manure combining with other agronomic practices such as over irrigation and continuous cultivation. Shallow-groundwater of most wells in cropped lands of the Katumanna area has a higher degree of contamination with basic cations, and NO_3^-N making it unsuitable for human consumption. EC and pH values in the water of some wells in the area showed poor irrigation water quality as well.

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