

Abstract

Makueni, Machakos and Kitui Counties, located in the Arid and Semi-Arid land (ASAL) region of south-eastern Kenya, receive low and unreliable rainfall which necessitates a high dependence on groundwater for potable, domestic and agricultural purposes. The geology of the region is dominated by metamorphic rocks of the Precambrian Mozambique Mobile Belt and Tertiary-Pleistocene volcanic rocks both of which are known to have highly variable concentrations of diverse naturally occurring potentially harmful elements. The geochemical composition of local soils and groundwater reflect the chemistry of the parent geological material and this constrains the type and concentrations of elements and nutrients in drinking water and locally produced food. This review reports the occurrence of some commonly reported potentially harmful elements, fluoride (F^-), iron (Fe) and salinity, in groundwater, farm soil and commonly consumed food crops in parts of south-central Kenya and considers their potential health implications.

Drinking water issues are documented. The presence high F^- in drinking water is associated with dental fluorosis in Machakos and Makueni Counties. Iron in Makueni and Kitui Counties is associated with an undesirable brown colour and taste in drinking water. Salty water is a common drinking water problem in most parts of Kitui and Makueni Counties that has led to the abandonment of shallow wells. Groundwater and spring water analysis show elevated F^- (max. 9.30 mg/l), Fe (max. 7.60 mg/l) and salinity (max. hardness, chloride (Cl^-) and magnesium (Mg) of 950 mg/l, 260 mg/l and 122.40 mg/l, respectively). In soils, elevated F^- levels were reported in Kitui County while acidity and salinity in soil were reported throughout the region. The effects of high F^- soils are not reported, but acidic and saline soils were found to be unproductive for maize and green grams farming.

Chemical and nutritional analyses of food crops grown in the area are essential to determine overall health implications on the local population. Detailed soil and groundwater geochemical databases are required in the region in order to assess the potential health implications of the natural environment on the local population.