

Nitrate pollution in groundwater of Sri Lanka

by K.M.B.M. Konara



We all know that water is one of the essential needs of living organisms. Despite the fact that world is covered with 70% water, only about 0.3% of it is fresh and available for human use. Meanwhile, groundwater accounts for 0.6% of total global water.

Use of this groundwater for irrigation is rapidly increasing in Sri Lankan agricultural sector due to the limited rainfall and poor surface water availability, especially in dry zone. Groundwater usage allows farmers to grow more crops, minimize the impact of droughts, and continue their livelihood. Besides, groundwater is the only source of drinking water for many rural communities in Sri Lanka. But unfortunately, increasing groundwater pollution induced by anthropogenic activities had led to a rapid reduction in groundwater quality of many areas.

Nitrate(NO_3^-) is one such major groundwater pollutant associated with commercial agriculture. Synthetic and organic fertilizers added to agricultural fields are the primary sources of nitrate in ground water. Although nitrate and other nitrogenous compounds support the growth of fauna and flora by providing the essential element nitrogen, nitrate is potentially hazardous for human health when present at high concentrations in drinking water. Thus, nitrate pollution in groundwater has become a matter of grave concern of groundwater consumers and health authorities.

Health issues arise due to nitrate pollution of drinking water

The World Health Organization (WHO) has recommended 50 mg/L as the maximum permissible nitrate level in drinking water. Consuming nitrate exceeding this limit can lead to low blood oxygen concentrations and cause methemoglobinemia (also known as blue baby

syndrome). In addition, nitrate exposure can cause other health effects such as increased heart rate, nausea, headaches, and abdominal cramps. Some studies also suggest an increased risk of cancer, especially gastric cancer, due to excessive consumption of nitrate.

Where this issue is prominent?

High nitrate concentrations in groundwater was first reported in Jaffna around 1984 underneath sandy regosols cultivated with annual crops in coastal areas of Jaffna. In 1990, groundwater nitrate concentrations above permissible levels were reported in Kalpitiya and Mannar. A study conducted in 2008 reported that about of 56% of 225 drinking water wells in Kalpitiya contain nitrate above WHO's maximum permissible level.

These are only few reported cases of groundwater nitrate pollution in Sri Lanka. These data suggest areas with sandy soils are more vulnerable for groundwater pollution. It is because sandy soils have less clay and organic substances, which are capable of retaining many contaminants within the soil system and purifying water before it reaches groundwater. Hence the downward movement of nitrate from soil to groundwater is faster through a sandy soil than clayey soils.

The risk of groundwater contamination in other areas of our island is not known. You must be cautious about the glass of water you drink in agricultural areas, urbanized areas, or an industrial zone. On the other hand, aquifers in Sri Lanka are situated in shallow depths, making them easily contaminated. So that water from your well or tube well may not be safe to drink if located in agricultural area!!

How to overcome this issue?

Some changes in land use management practices are essential to protect the water quality. Avoiding the excess application of