

Impact of Oil and Gas Production Operations on Soil Quality of Nearby tea Gardens in Galeki & Lakwa Oil Field of Assam Asset, India

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Abstract—Assam Asset has been engaged in hydrocarbon exploration and production operation for decades and this study is an effort to determine the effect of oil and gas production operations on the nearby tea gardens. The present study is to determine whether the nearby tea gardens are getting contaminated by produced water in terms of heavy metals such as Ba, Cd, Cr, Fe, Mn, Pb and Zn and Petroleum hydrocarbon.

Surface water, soil, tea root samples were collected from nearby tea garden of production installation. Water, soil and root sample were analysed for Ba, Cd, Cr, Fe, Mn, Pb, and Zn. Petroleum Hydrocarbon content was also determined in each sample. Sample preparation for metal analysis was done by digesting of 0.5 g sample with a mixture 6 ml concentrated HNO₃ (65%), 3 ml HCl (36%), 2.5 ml H₂O₂ (30%) and made volume up to 100 ml with distilled water. The analysis was carried out in Inductively Coupled Plasma – Optical Emission Spectrometer (ICP-OES) Perkin Elmer model OPTIMA 2000 D. Digested samples were introduced through nebulizer using Argon gas of 99.99 % purity. Argon gas was also used for plasma and as auxiliary gas. The individual metal ion emissions were detected by Optical Emission Spectroscopy.

In case of surface water quality, only Iron and Manganese were found higher than the drinking water standard. All other metals concentration i.e., Ba, Cd, Cr, Pb, and Zn were found within drinking water standards. The results of soil analysis showed that quality is not adversely affected much by operations. Cr, Cu, Ni, Pb and Zn in soil were found at levels lower than the Indian standard value. Organic carbon, Nitrogen, Potassium oxide, Phosphorus pent oxide and pH of the soil were all found to be limits suitable for tea cultivation. Petroleum Hydrocarbon content were found to be below detectable limit. This shows that pollutants from oil & gas operations are not getting mixed with either ground water or surface water.

The study is innovative since it serves to prevent or reduce anthropogenic burdens on the environment namely oil and gas pollution on tea gardens. It provides additive information for clean-up damage if already caused or diagnose and monitor environmental problems.