Arsenic cycle in irrigated regions of West Bengal, India

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Nearly 44% of West Bengal population (80 million) suffer from arsenic related diseases like melanosis, hyperkeratosis, conjunctivitis etc. Arsenic content in groundwater varies from 0.05 to 3.7 mg/L with an average of 0.2 mg/L. Now this problem has taken a serious turn with arsenic entering the food chain. This problem is very severe in tube well irrigated rice fields. Arsenic content in rice grown in such irrigated fields is 0.3 mg/L that is greater than the average content of arsenic in groundwater (Norra et al., 2005). The root of rice plant in such irrigated fields accumulate large quantities of arsenic available in groundwater. Due to the prevailing rice cultivation practices in India (common in all the south-east Asian countries), the soil in the rice field get enriched in arsenic due to the recycling of arsenic rich roots in the soil. These rice field are always under reducing condition due to standing water column in the rice fields and also due to flooding during monsoon season. These tube well transfer arsenic rich water to the rice fields from deeper aquifers while arsenic released from the soils in th rice fields percolate in to the top shallow aquifers. However in the case of rice fields irrigated with surface water, roots registered low arsenic content (21 ppm). Such low content of arsenic in roots is due to lower concentration of arsenic in the irrigated water. The river water (7-8 ppb) and river bed sediments (9 mg/L: River Ganges), have arsenic of content much lower compared to the groundwater. Besides roots and rice grain, the arsenic content in stem, leaves (7ppm) and husk (1 ppm) is much higher than the limit prescribed WHO (50 ppb). The husk is used to extract cooking oil while the leaves are fed to the cows and buffaloes. Even though these animals are not affected by such high arsenic containing fodder, the effect of their milk and meat on human is poorly understood.

Norra, S., Berner, Z.A., Agarwala, P., Wagner, F., Chandrasekharam, D. and Stüben, D. 2005. Impact of irrigation with As rich groundwater on soil and crops: a geochemical case study in Maldah District, West Bengal App. Geochem. 20, 1890-1906.