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Disentangling agro-contaminant sources and transport pathways in agricultural ecosystems using stable isotopes

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This project is employing stable isotope techniques in addition to classical chemical methods to give an understanding of the agricultural pollution budget within the Densu River Basin in Ghana. The Densu River provides water to the Weija Lake, which is an important water resource supplying close to 70 percent of the potable water needs for the capital city of Ghana. In the past decade, the deteriorating quality of water in the Weija Lake has raised concerns about pollution from anthropogenic sources within the Densu River Basin. This has prompted studies to identify the various sources of pollution to the river and to track the pathways of these pollutants.
Stable isotopes serve as important tools which can be explored for tracing the origin and movement of nutrients and contaminants in agricultural ecosystems. Understanding these processes can lead to the development of strategies to support agricultural water management and inform the adoption of farming practices that can mitigate pollution from agriculture into soil and water bodies.
This project is analyzing stable isotopes of water, pesticides and fertilizers, and employing stable isotope analysis of δ18O(H_2O), δ2H(H_2O), δ15N(NO_3), δ18O(NO_3) δ34S(SO4), δ18O(SO4), δ13C(POM), Pesticide Compound Specific Isotope Analysis, Oxygen Isotopes in Phosphates, in addition to hydrogeochemical methods to identify the sources and transport mechanisms of the agro-contaminants into the Densu River as well as groundwater in the Densu River Basin. These stable isotopes of C, N, H, S and O form an integral part of the agricultural water management. This makes it possible to track the movement and pathways of water within the agricultural ecosystem. By doing so, important information about plant water use, farming practices, irrigation and cropping systems are understood. This would allow the development of innovative strategies to reduce unproductive water losses while improving food production in the Basin and mitigating pollution to the Densu River.