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An interdisciplinary approach for groundwater management in area contaminated by fluoride in East African Rift System

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Groundwater is the main source of fresh water supply for most of the rural communities in Africa (approximately 75% of Africans has confidence in groundwater as their major source of drinking water). Many African countries has affected by high fluoride concentration in groundwater (up to 90 mg/L), generating the contamination of waters, soils and food, in particular in the eastern part of the continent. It seems that fluoride concentration is linked to geology of the Rift Valley: geogenic occurrence of fluoride is often connected to supergenic enrichment due to the weathering of alkaline volcanic rocks, fumaric gases and presence of thermal waters.
The H2020 project FLOWERED (de-FLuoridation technologies for imprOving quality of WatEr and agRo-animal products along the East African Rift Valley in the context of aDaptation to climate change) wish to address environmental and health (human and animal) issues associated to the fluoride contamination in the African Rift Valley, in particular in three case study area located in Ethiopia, Tanzania and Kenya.
FLOWERED aims to develop an integrated, sustainable and participative water and agriculture management at a cross-boundary catchment scale through a strong interdisciplinary research approach. It implies knowledge of geology, hydrogeology, mineralogy, geochemistry, agronomy, crop and animal sciences, engineering, technological sciences, data management and software design, economics and communication.
The proposed approach is based on a detailed knowledge of the hydrogeological setting, with the identification and mapping of the specific geological conditions of water contamination and its relation with the different land uses. The East African Rift System (EARS) groundwater circulation and storage, today already poorly understood, is characterized by a complex arrangement of aquifers. It depends on the type of porosity and permeability created during and after the rock formation, and is strongly conditioned by the tectonic and volcanic processes. Data regarding geological and hydrogeological settings and the assessment of the vulnerability of groundwater bodies will constitute the necessary information for the implementation of a sustainable water management and for the proposal of sustainable and suitable strategies for water sanitation and agricultural system.
Taking into account the vulnerability of the aquifers and groundwater circulation, innovative agricultural practices will be assessed too, aiming to mitigate the impacts of fluoride contamination of water and soil on productivity of selected food and forage crops and dairy cattle health and production. Innovative defluoridation technologies for the sanitation of drinking water, which mainly operate at rural area scale, will be tested and implemented, aiming at providing a sustainable and safe water supply. Furthermore, the development of an innovative and shared Geo-data system for the knowledge management will support the implementation of an integrated, sustainable and participative water and agriculture management system. Moreover, supported by the Small and Medium-sized Enterprises (SMEs), a developed market analysis for the proposed defluoridation technologies accounting also for the social and environmental factors will be included in the project.