IMPROVING THE SUSTAINABILITY AND PRODUCTIVITY OF POOR SMALLHOLDER FARMERS IN NORTHERN GHANA USING ELECTROMAGNETIC INDUCTION GUIDED PRECISION IRRIGATION

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Northern Ghana spans almost half of the country with a semi-arid climatic condition. While the primary occupation of the people is farming, the hot and dry conditions coupled with only one raining season limit the farming season to only 4 to 5 months of the year, making Northern Ghana the most poverty-ridden area in the country. The poverty situation has fueled a coping mechanism of rural-urban migration to big cities in search for meagre or non-existent jobs. Small-scale irrigation from the White Volta River and its tributaries presents a unique opportunity for dry-season farming to provide off-season employment. Their current irrigation scheduling practice, however, ignores the underlying soil characteristics that control the water-holding capacity (WHC) of the soil, rendering the practice inefficient.

The primary goal of this Geoscientists without Borders (GWB) project is to assist poor small-scale farmers to make judicious use of their limited irrigation water, with the long-term goal of enabling dry-season farming to promote socio-economic development and food security. Infiltration rates and WHCs of soils, which determine plant available water, are primarily controlled by the underlying soil texture. To sustain the long-term benefits of the project, we will create a precision irrigation framework (PIF) for the entire project region using a multiscale approach. First, we will combine satellite imagery and direct soil sampling to create a large-scale texture map for the whole project area. Second, we will employ an electromagnetic induction characterization of soils to create high-resolution pseudo-soil maps of project farms to create subfield water management zones (WMZs). We will calibrate the WHCs of soils within the WMZs through field infiltration tests. We will unify the high-resolution data acquired at the farm-scale with the large-scale texture map to produce a PIF for the project region. Here, we will present results of the year one field work.