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Author: Dr. Martina Anna Maggioni
Charité Universitätsmedizin Berlin, Germany

HEAT TO HARVEST: AN INNOVATIVE APPROACH TO QUANTIFY HARVEST LOSS FOR REDUCED LABOR CAPACITY CAUSED BY HEAT STRESS IN THE CONTEXT OF CLIMATE CHANGE

Abstract

Climate change is projected to lead to environmental conditions in which human labor capacity will be dramatically reduced. This will pose enormous constraints for subsistence farming, the main source of income in Sub-Saharan Africa (SSA). Extreme heat exposure while performing heavy physical work, as agricultural labor, is associated with negative health outcomes, and can also lead to the loss of livelihoods, food security, and potentially poorer nutritional outcomes as well as compromised growth in children. The Heat to Harvest (H2H) is an innovative study quantifying the effect of heat exposure, modified through home cooling interventions on outcomes including heat stress, labor capacity during harvest, harvest yield and undernutrition in children. During the harvest season we will provide farmers with commercial grade wearables to obtain continuous data on heart rate and physical activity (fitness trackers) and working pattern (GPS). We will collect environmental data in the form of outdoor Wet Bulb Globe Temperature data from a local weather station. Harvest yield quantities will be estimated through a spatially explicit, remote sensing-based crop yield model. This model is based on a novel three-year in-situ data set of yield measurements and uses freely available satellite data from Sentinel-2 with a spatial resolution of 10m as well as Climate Hazards Group InfraRed Precipitation with Station (CHIRPS) rainfall data. We aggregate rainfall data weekly and compute monthly vegetation index composites from the Sentinel-2 data as input data sets for the model. The LASSO regression model produces yield predictions at the field level and can therefore provide yield information on a household level, which will be incorporated into our H2H study. We will also account for housing interventions such as cooling solution by comparing data from those living in households with the cool roof intervention against control households and the respective nutritional status of their children. The adverse effect of climate change on agricultural production and developments in agricultural techniques have been described in the literature. Our study adds critical knowledge on how reducing indoor temperature and improving thermal comfort influences farmers' labor capacity and harvest yield in SSA – a region severely affected by climate change.