Biophysical characterization of watersheds in northern Ghana

Davie Kadyampakeni[1], Fred Kizito[2], Asamoah Larbi[3], Benjamin Ghansah[1], Richard Appoh[1]
[1]International Water Management Institute (IWMI)
[2]IInternatonal Center of Tropical Agriculture (CIAT)
[3]International Institute of Tropical Agriculture (IITA)
Corresponding author email: d.kadyampakeni@cgiar.org

Key research activities

- Long term climatic data characterization
- Long term hydrological and stream flow analysis for selected AFRICA RISING watersheds
- Delineation of catchments and estimation of water balance for agricultural production
- Assessment of landscapes and water resources was developed to serve as a baseline for Tamale and Navrongo watersheds for assessing aggregated impacts on land and water resources of sustainable intensification (Fig. 1 b and c)

Results and main findings

- The average annual variability in rainfall is significantly higher than the variability in annual potential evapotranspiration (PET) (Fig 1a and d, Table 2)
- Temporally, water surplus occurs in 3-4 months in a year.
- The mean annual water inputs from rainfall were calculated to be 989 mm (±90 mm) for Navrongo and 1,013 mm (±75 mm) for Tamale.
- The PET was estimated to be 1,977 mm for Navrongo and 1,866 mm for Tamale.
- Agricultural water management interventions on irrigation and soil water conservation measures are needed to reduce crop impacts due to water variability and improve agricultural productivity in Navrongo and Tamale watersheds.

Implications of the research for generating development outcomes

- The results will result in guidelines for supplementary irrigation and soil and water conservation in the rainy season for improving food security and household incomes.
- The result further show the opportunity for using stream flows and shallow groundwater as sources of water for irrigation in the dry season.

How this work would continue in Africa RISING phase 2

- Development of guidelines through estimation of site specific crop and irrigation water requirements for cereal, legume and vegetable crops.
- Provision of weather-based technologies for irrigation scheduling to farmers.
- Demonstration of supplementary irrigation in the selected watersheds.

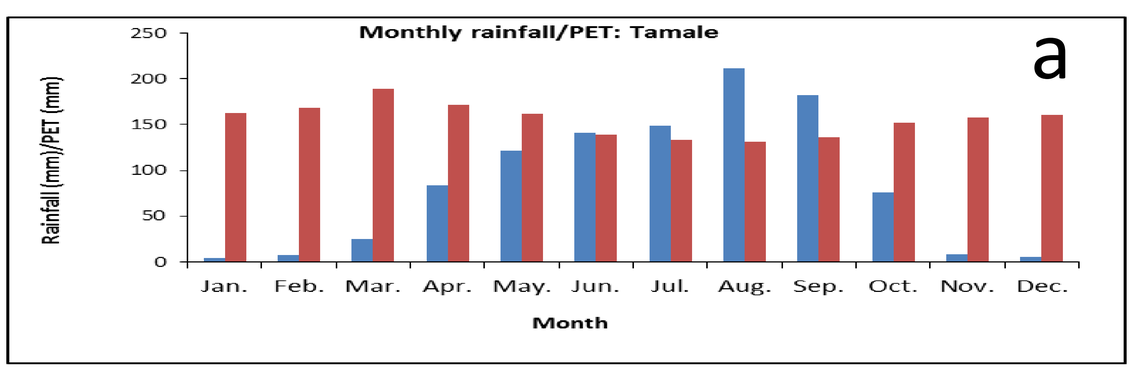

Figure 1: Rainfall and potential evapotranspiration, and catchment maps for Navrongo and Tamale watersheds.

Table 2: Summary statistics of the climatology of the selected project watersheds in Ghana

Watershed	Rainfall (mm)	Rain days (days)	Potential Evapotranspiration (mm)	Mean Temp (°C)	Minimum Temp (°C)	Maximum Temp (°C)	Aridity Index
Tamale	1013 (523-1358)	89	1866 (1799-1966)	28.2	22.6	33.8	0.54
Navrongo	989 (688-1365)	74	1977 (1911-2060)	29.1	23.0	35.2	0.50

Current partnerships and future engagements for out scaling

- CGIAR Centers: IITA, CIAT
- Universities: Kwame Nkrumah University of Science and Technology
- NGOs: Conservation Alliance International
- USAID FtF Projects e.g. ATT, SPRING and RING
- Farmer Organizations

The Africa Research In Sustainable Intensification for the Next Generation (Africa RISING) program comprises three research-for-development projects supported by the United States Agency for International Development as part of the U.S. government's Feed the Future initiative.

Through action research and development partnerships, Africa RISING will create opportunities for smallholder farm households to move out of hunger and poverty through sustainably intensified farming systems that improve food, nutrition, and income security, particularly for women and children, and conserve or enhance the natural resource base.

The three projects are led by the International Institute of Tropical Agriculture (in West Africa and East and Southern Africa) and the International Livestock Research Institute (in the Ethiopian Highlands). The International Food Policy Research Institute leads an associated project on monitoring, evaluation and impact assessment.

www.africa-rising.net