

# Mean water balance dynamics and smallholder management options for improved agro-ecosystem productivity

F.Kizito<sup>1</sup>, E. Salifu<sup>1</sup>, W. Agyare<sup>2</sup>, Cofie, O<sup>3</sup>,

<sup>1</sup>International Center for Tropical Agriculture (CIAT), Nairobi, Kenya;

<sup>2</sup>Kwame Nkrumah University of Science and Technology (KNUST) Kumasi, Ghana;

<sup>3</sup>International Water Management Institute, Accra, Ghana.

Corresponding author email: [f.kizito@cgiar.org](mailto:f.kizito@cgiar.org)

## Key messages

- Quantitative approaches in estimating fluxes of soil, water and nutrients (Fig.1) provide vital management insights that help increase smallholder farm productivity.
- Increase in farm productivity is partly as a result of soil and water conservation that includes a suite of management options for smallholder conventional farming systems.

## Objectives and approach

Improve smallholder agricultural productivity through sustainable intensification by improved management of soil, water and nutrient resources.

### Approach:

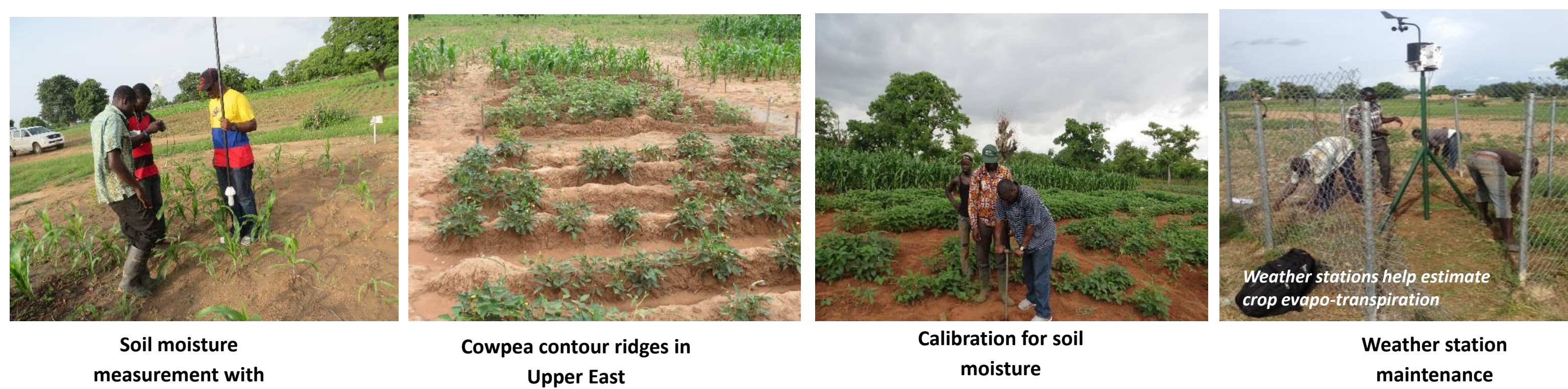
- Studying the seasonal variations of annual runoff and soil moisture storage levels within smallholder farming systems
- modelling of soil moisture storage, runoff, soil loss and maize yields from farm to watershed scale.

## Key results

- Evapotranspiration and surface runoff were the major drivers of the water budget (Fig. 2)
- For both field scale and at the watershed scales, it is evident that the use of management options like contour farming, contour ridging and half-moon were superior to the conventional practices in reducing runoff and sediment losses and increased soil moisture storage and maize yield (Fig. 3).

## Significance and scaling potential

- Harnessing of the “green water” (soil moisture within the root zone) helps counteract evapotranspiration losses but also would improve in-situ capture and storage which in turn reduces surface runoff losses in these environments that are highly moisture limited.
- Assessing the economics of soil and water conservation methods will help unlock adoption potential for subsequent scaling since they tend to be labor intensive. This can be scaled through exploring ICT platforms.
- The use of dual purpose cover crops such as cowpea or forage grasses will help preserve moisture, reduce erosion, help with nitrogen fixation but at the same time can serve as fodder/feed and food for smallholder farmers.



## Partners



We thank farmers and local partners in Africa RISING sites for their contributions to this research. We also acknowledge the support of all donors which globally support the work of the CGIAR centers and their partners through their contributions to the [CGIAR system](http://CGIAR.org)



This poster is licensed for use under the Creative Commons Attribution 4.0 International Licence. January 2017

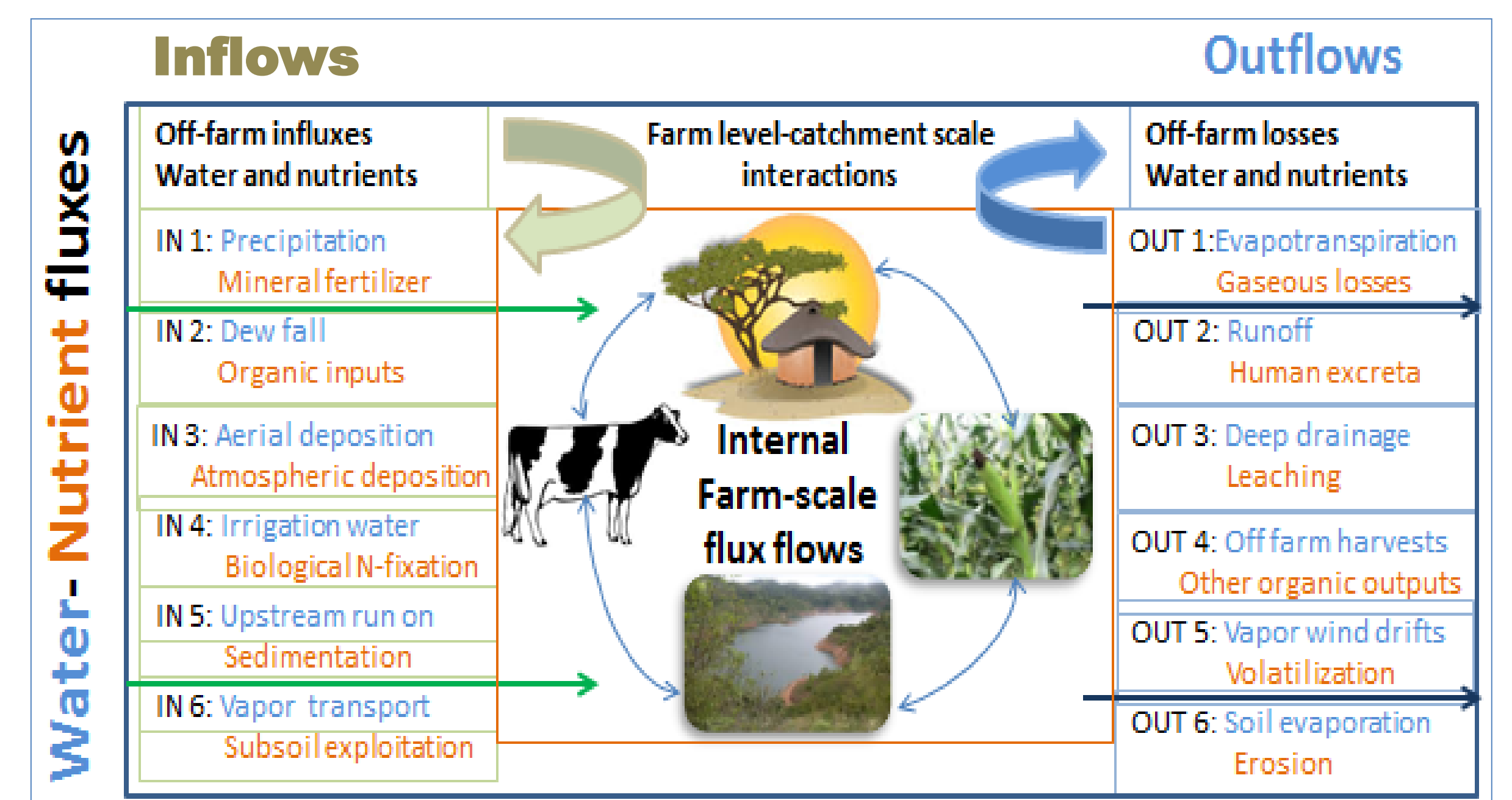


Figure 1: Conceptual representation of water and nutrient flow dynamics that capture the farm-level to landscape scales

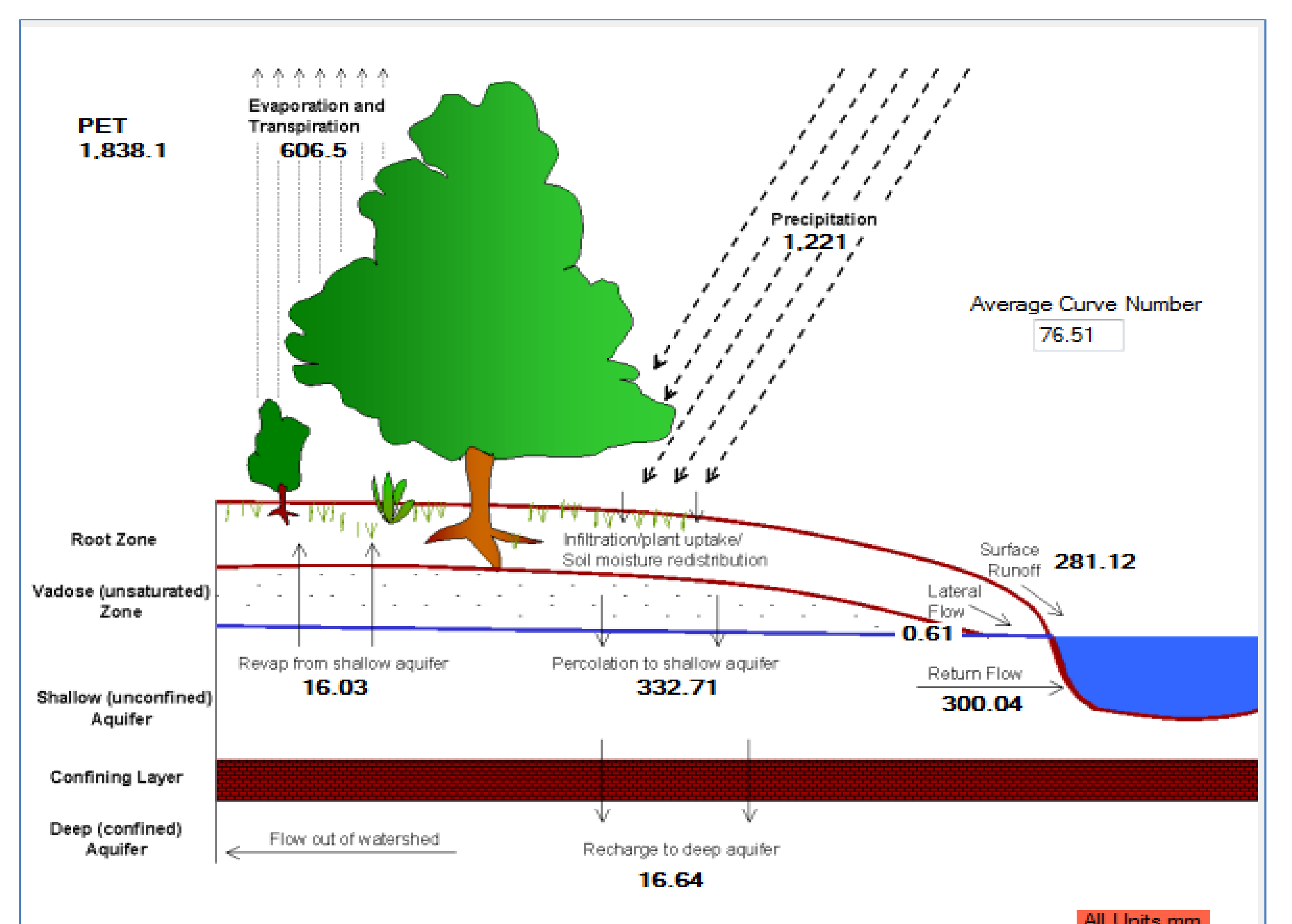


Figure 2: Mean water balance trends in farming system for 2014 and 2015

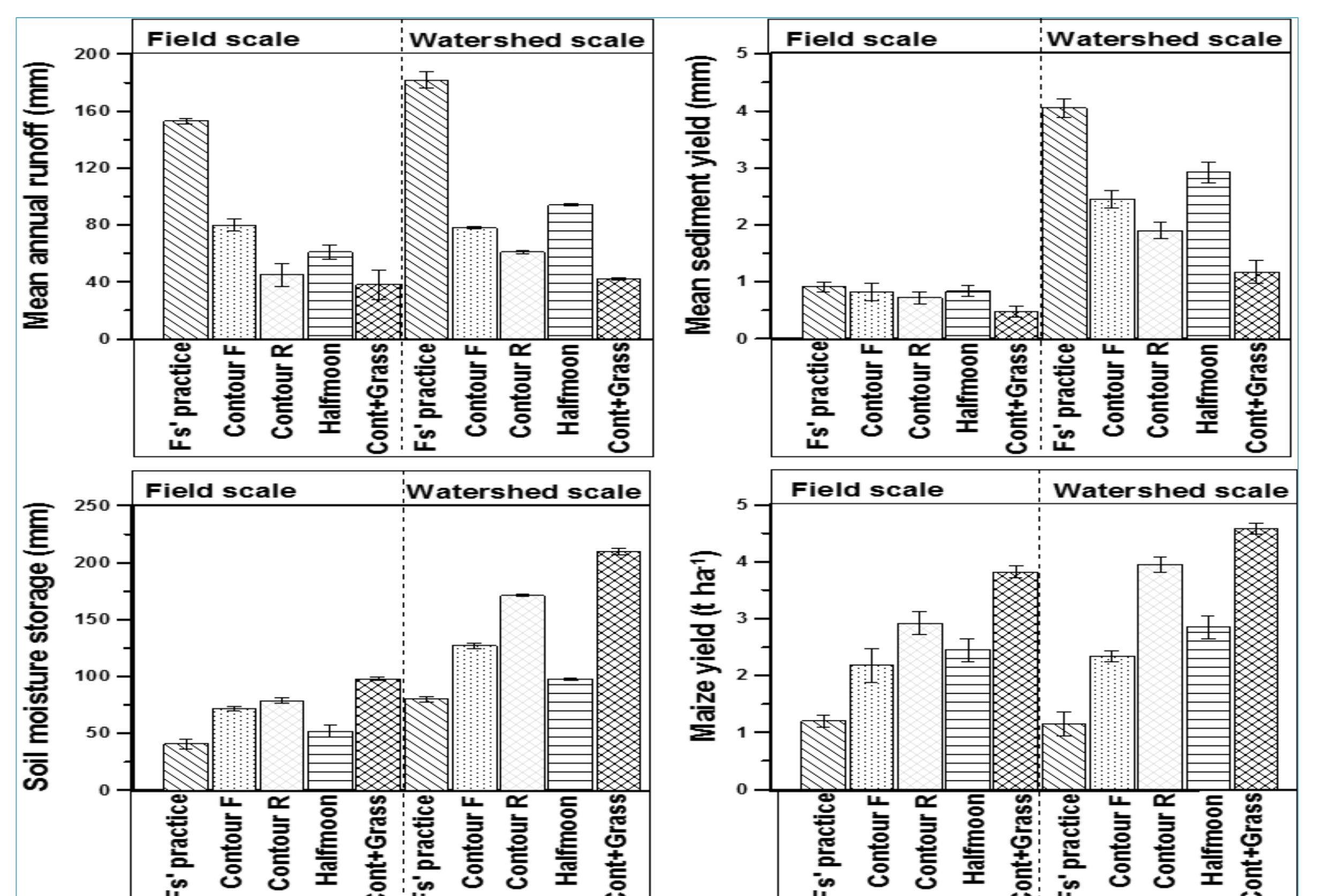


Figure 3: Mean farm scale and watershed scale fluxes for Nyangua and Bonia under varying management options