

Interactive comment on “Modelling field scale water partitioning using on-site observations in sub-Saharan rainfed agriculture” by H. Makurira et al.

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Comments on the manuscript "Modelling field scale water partitioning using on site observations in sub Saharan rainfed agriculture " by Makuria and co workers

Summary The objective of the present study is to quantify the effect of traditional and improve surface preparation/ farming techniques to improve infiltration and retain more water for crop growth in soils in semi-arid areas. Study areas are two field sites in Makanya basin in northern Tanzania. The authors use a simple spread sheet water balance model to simulate soil moisture dynamics at the different sites. Simulation re-

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sults are compared to TDR data gained at 4 locations to investigate the effect of the "fanya yuu" method on the soil moisture regime. Input data into the water model is rainfall and surface runoff, measured on site. Infiltration is determined as residual after modelling transpiration, interception and soil evaporation. The authors provide simulation evidence that their model can capture weekly/biweekly soil moisture dynamics partly in a satisfying partly unsatisfying manner. They conclude that the tested preparation/ farming techniques improve water retention in the soil and assure more favourable conditions for crop growth.

Evaluation: The paper deals with a very interesting topic that is crucial for farming in rainfed drylands in many areas in the world. The data base seems as far as I could evaluate sound and the modelling results are promising. The paper has potential to make an interesting contribution to HESS. However, in the present form the study suffers from several very serious shortcomings. The following major and minor points should be thoroughly addressed, before the manuscript can be considered for publication.

Major points:

- Neither the model structure, nor the parameterization nor the way the authors include the effects of surface preparation is reported in a way that is it is reproducible/transparent. How did you simulate soil moisture at the 4 different tubes with a lumped zero dimensional model? With multiple set ups? How to account for surface redistribution of water downslope (when looking at your figure 2), did you neglect that. I miss essential information about crucial model parameters governing evaporation, transpiration, interception, water retention in soil. Such information is indispensable for a scientific paper.

- Any kind of conceptual model has to be validated. Especially when dealing with input data that have a strong seasonality as in the present case. I cannot see how this was done. Without this the value of the model study remains unclear to me.

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- The suitability of the model concept for this purpose and scale should be discussed and justified. There is a huge set of physically based models, (Hydrus 1D, CATFLOW, SWAP) that can be parametrised using pedotransfer functions. Plant physiological parameters could be taken from available data bases. Such a model would allow a much more detailed and reproducible assessment of the effects of surface preparation on the soil moisture regime.

Technical points

- For my taste the introduction should put a little more emphasis on relevant hydrological studies in this field.
- Does the interception model depend on LAI, if so please mention?
- What is the integration depth of your TDR measurements? How does the model domain relate to this depth?
- How did you measure surface runoff and runoff exactly?
- Which crops were at the field or was it a bare soil? Which soils do you deal with?
- Do you mix upstream and upslope when addressing Figure 2 and several times in the text?
- Heading of Figure is insufficient to explain the farming technique method.
- Figure 4 and 5 should be improved. The axis titles are too small to be read.

Erwin Zehe

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