

Interactive comment on “Assessment of strip tillage systems for maize production in semi-arid Ethiopia: effects on grain yield and water balance” by M. Temesgen et al.

M. Temesgen et al.

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We would like to thank referee #1 for his critical review and we apologise for replying so late. This was due to the first authors stay in Ethiopia, during which it was hard to make all the corrections required.

First of all, we agree with the referee that the paper contained several flaws and was not very well written or organised. However, the treatments described are very valuable improvements for smallholder farming in Africa and the results obtained are correct. We think we have demonstrated that subsistence farmers in Africa can improve their yields substantially by using relatively simple and cheap implements that they can

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manufacture themselves. In doing so, they reduce surface runoff and erosion, improve the nutrient balance and increase yields. We have taken the criticism seriously and substantially revised the final paper that will be submitted shortly. We don't agree that we confuse definitions, but maybe we have not been fully clear in describing our terminology. We do so below:

Evaporation is the process that transforms liquid water into vapour. As Shuttleworth (1993) defines it, *it is the rate of liquid water transformation to vapour from open water, bare soil, or vegetation with soil beneath. Transpiration is that part of the total evaporation which enters the atmosphere from the soil through the plants.* Hence the total evaporation consists of different sub-processes: open water evaporation, bare soil evaporation, transpiration, and evaporation from interception. Depending on the stocks from which these sub-processes draw, they have different time scales. Evaporation from interception is a fast process, because the stock is small. As a result, interception (the process of intercepting rainfall) may be equated to the evaporation from interception at time scales of days or longer. Therefore evaporation from interception may be briefly called interception. Also the total evaporation, which is sometimes called evapotranspiration, may be briefly called evaporation. In view of the fact that the sub-processes are very distinct in nature, it is better to avoid the term evapotranspiration and use the term total evaporation or just evaporation (Savenije, 2004). The above definitions are fully in line with the definitions used by Shuttleworth (1993) and Brutsaert (2005).

If, on a daily timescale the variation of the amount of water stored on the land is small compared to the fluxes, the storage variation may be disregarded and infiltration may be equated to the total rainfall minus interception minus surface runoff. In the interception process we make use of a daily threshold. This interception threshold refers to the part of the rainfall that is held by plant leaves, stems, litter and wetted soil. The thresholds for surface runoff refer to the sum of interception and soil wetting that occurs before the process of surface runoff begins at a scale of the test plot.

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We have now given clear definitions for interception and evaporation from interception.

The process of interception (I) is described as: $I = (dS_I/dt + E_I)$

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where S_I is the interception storage and E_I is the evaporation from interception. When at a long enough time scale (one day) the storage variability can be neglected, the process of interception equals the evaporation from interception. The flux can then be briefly called interception. This is explained in the paper. We have made the terminology consistent.

We have addressed all the detailed comments in a rebuttal that shall be added to the resubmission of the final paper to HESS, which we shall submit shortly.

We would like to thank referee #1 for the very sincere and detailed review. In the final version we have benefitted a lot from your critical remarks.

References

Brutsaert, W., 2005. Hydrology, and Introduction. Cambridge University Press. pp. 605.

Savenije, Hubert H.G., 2004. The importance of interception and why we should delete the term evapotranspiration from our vocabulary. Hydrological Processes, 18(8):1507-1511.

Shuttleworth WJ. 1993. Evaporation. Chapter 4. In: Handbook of Hydrology, Maidment DR. McGraw-Hill: New York, USA.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 4, 2229, 2007.

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