

## ***Interactive comment on “Spatial and temporal runoff processes in the degraded Ethiopian Highlands: the Anjeni Watershed” by H. K. Bayabil et al.***

**Anonymous Referee #2**

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Review comments on Hydrol. Earth Syst. Sci. Discuss 12, 4387–4411, 2015 Understanding hillslope hydrologic during rainstorms is a prerequisite for improved catchment management. In the past few decades, many experimental hillslope studies have been conducted to understand rainfall–runoff processes. Classically, there are two mechanisms of surface runoff generation: (1) Hortonian flow that occurs when rainfall intensity exceeds infiltration capacity of the soil and (2) saturation excess surface runoff that occurs when the perched water table rises, saturating the whole soil profile and creating a seepage face. Although these mechanisms have been used to classify overland flow (OF) mechanisms throughout the world, there is still a lack of knowledge in terms of

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their factors that control (Sen et al., 2010; Van de Giesen et al., 2010; Orchard et al., 2013). By focusing on different land uses, it is this gap that the present study aims at investigating.

Despite this paper being of main interest, it still requires significant revision before publication in HESSD can be granted. The structure and content of the introduction could be greatly improved and so far the authors' materials and methods are not adapted to the research objectives. Plots with different sizes and followed during different periods are used but can't be compared; The basic assumption in research studies aiming at studying one factor is to hold the other factors constant, which was not valid here (there were at least changes in tillage and possibly landscape position between the plots). The obtained results should be discussed, i.e. confronted to the existing literature.

Title. Are the authors investigating runoff “processes”? what processes?. Isn't the paper about land use impact on water losses in the degraded. ...?

Introduction.

First of all, the structure of the introduction should be significantly improved to better account for the different processes of OF and to lead the reader to research gaps and research objectives. There are many different ways of writing an Introduction. This depends on the academic subject involved, the journal itself and the specific topic of the article. It is important for the purpose of the research that authors can follow standard patterns as follows: A. Presenting the background of the subject; B. Indicating the importance of the research on the subject; C. Acknowledging what has been done so far on the subject by referring to existing research studies and reporting ones; referring to methods and ideas associated with other researchers; D. Pointing to a gap in knowledge of the subject; E. Selecting research objectives F. Explaining the organisation of the research

The first 3 lines of the existing introduction should be moved at the end of the introduction. The introduction should begin by a description of the OF processes and their

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controls: what is known and unknown to lead to research gaps and specific objectives. Then the case of Ethiopia with different land uses.

Rooting depth is a key factor that appears at the end of the introduction. If this is really looked at, then the existing literature on its impact on OF should be further introduced. Note that biochar is produced for being used for cooking, not available for crops. What are the "soil-water relationships" the authors aim at considering? Please justify why land use controls stream volumes? Soil properties and water table dynamics are other factors to be considered; high correlation between these and landscape position; Please, inform further on the previous works in Ethiopia on runoff studies; Different treatments are proposed and need to be better justified

Materials and methods. OF in the study seems not only affected by land use and topographic position but also by tillage as some plots have been tilled while others were not. Conclusions on a given factor of control thus become uncertain. I thus strongly suggest not to consider 2013 data for which soils under Lupin have been tilled). It is simply not possible to conclude on a land use impact if different tillage conditions occurred. By keeping the 2012 data, the authors should have sufficient data to test their hypothesis of a land use impact on OF. Furthermore, why so many factors? Why charcoal and why not having Lupin with charcoal? There are too many factors here and too little plot replicates. Charcoal data have certainly to be removed. The experimental design should be better presented. A table could help to show the different treatments and replicate per treatment, and together with the landscape positions. Ideally and following standards, there should be 3 plot replicates for each combination between landscape position and land use. Some long term monitoring plots with a different size and with data obtained at different dates are added to the work. Please remove them. Fig 5: where are the different slope positions. Plots at different slope positions can't be considered as replicates as topography is one of the main OF controls. How different are data displayed in fig 6 than fig 3? Please, focus on landscape position and land use Fig 7: data are too scattered to identify trends. What is the purpose of this figure?

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Results. The presentation of the results should be improved: The data from the catchment outlet are not really used: should be deleted; Historical data are not necessary; Data should be presented by land use and by landscape position with ANOVA to test the impact of both land use and landscape position. Figure 3 can't be read, too small: can't see treatments, can't see runoff, where are the different slope positions?

Discussion. To be generated Discussion section may fulfil one or more of the following functions: A Presenting background information B Summarising what was (not) done C Explaining why it was (not) done D Evaluating the method(s) or model used E Statement of result(s) F Explanation of result(s) – why and how it happened G Implication of the result(s) – what it does, or does not, imply H Making reference to previous research I General statement of interpretation J Elaboration of interpretation K Discussing implication(s) of the interpretation L Rejection of interpretation M Acceptance of interpretation N Making a recommendation O Stating the limitations of the data P ..... (other)

Conclusion A. Remind of research objectives B. Statements of general findings C. Statements of specific and significant findings D. Statement of overall trends with respect to what was known prior to the study E. How well do results respond to initial gaps, research questions F. Making predictions; recommendations

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