

Interactive comment on “Towards systematic planning of small-scale hydrological intervention-based research” by K. E. R. Pramana et al.

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First, we would like to thank the comments and valuable suggestions of Anonymous Referee #1, which make us realize that our paper should be presented more coherently. Indeed, as the referee points out, we propose a more systematic way to understand and undertake small-scale hydrological research projects that 1) involve local populations and 2) evaluate the effects of an intervention in the land-water system.

We thank the referee for the acknowledgement that the goal of our paper is valuable. Part of its value, we suggest, is that although the issues we raise are recognized in the hydrological community– as the referee points out as well–they rarely discussed explic-

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ity in the academic hydrological community. As the referee points out, surprises and cost-benefit thinking are “implicitly, if not necessarily explicitly, built into the process of applying for and spending research funds”, but we aim to argue that more explicit attention helps to design more appropriate answers to the issues of surprise and budget based on better understanding of challenges faced in field studies.

Although we provide “a lot of good content” according to the referee, it is clear that we have not succeeded in proposing and discussing a more coherent, comprehensive framework. As is recognized by the referee, we have tried to include details of the three field-based cases studies that indeed have not been published before. We are grateful of the remark that this case study content is a major contribution of the paper, but we have to conclude as well that including much about the cases has created a paper that is less easy to navigate. Our proposal to solve this issue is given in our general comment, where we aim to combine the valuable suggestions of all three referees.

Specific comments

As will become clear in our general reply to the referees, some of the more hydrological details below may not be relevant anymore for a revised paper. We have provided answers nevertheless.

- p. 9491, Line 22, Clarification needed: please specify what “scientific research areas” refers to

We understand that “scientific research areas” might refer to an area of a certain expertise. However, here we meant the “scientific community”. We will use that term.

- p. 9498 line 6: “specific paths” for flow that are “concentrated in space” are usually referred to as “preferential flowpaths” in the literature. May want to use this language here too.

Correct, we will adjust the text accordingly.

- p. 9499, Modeling section – need to describe boundary conditions. Is infiltration

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measured with the tracer or other method? Shouldn't the modeling section come after the discussion of the collected data?

We will clarify. Infiltration was measured using inverse auger test, isotope O-18 tracer and dye tracer. Yes, we will place the paragraph of the tracer data before the modeling section.

- p. 9501, Conclusion here – that trenches increase groundwater levels – is not convincing as written. The description of the methods jumps around such that this conclusion is abrupt.

We will rephrase and add some extra bridge sentences to the second and third paragraph of the conclusion to explain the short-term increase of groundwater levels. What we tried to explain in the second paragraph (line 12-18) are the specific findings based on the data and modelling which are previously explained in general in the first paragraph. Shortly, the groundwater data showed two reactions; wells with and without increase. The one with increase showed also the O-18 signal. Based on these we concluded that the trenches increase groundwater levels. This will be clarified.

- p 9503 How does TRMM data help with vegetation growth detection?

We realize that the subtitle "Vegetation growth" might be misunderstood. TRMM provides only information of the amount of rainfall whereas MODIS-NDVI was meant to help with vegetation growth detection. Before this study, the claim was that trenches could increase vegetation growth. Thus we first checked the MODIS-NDVI of the area with and without trenches and compared them to see their differences. Afterwards TRMM was used to see any correlation between the rainfall and vegetation growth.

- p. 9503 Seems like if freely available data was needed, LANDSAT would be a much better choice than MODIS at the small spatial scale of consideration (hectares). Perhaps the weak results from this analysis discussed later have to do with the satellite data resolution?

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We agree that LANDSAT would be valuable. However, when we checked LANDSAT from 1984 to 2010, we found that LANDSAT availability for the study area was limited and scattered throughout the year; in 2002 (the construction of trenches), 2003, 2006, and 2008 only one satellite image, in 2004, 2005, and 2007 no images, and in 2009 and 2010 three images. Our Landsat data from 1984 show scattered values in time before the construction of trenches, but do confirm that the whole area has low NDVI values during the dry season and higher values during the rainy season.

- p. 9505 It is not clear how the NDVI analysis shows a short-term effect of contour trenching.

We compared the NDVI with and without trenches (a few hundred meter from the trench area). As in Fig. 8, the black column represents the difference between with and without trenches. Looking at the results of a few significant differences, we concluded that those trenches did show a short-term effect.

- p. 9510 Suggest rewording section heading 3 as “Human participation in hydrological research and intervention”

It is clear we discuss participation, but we would like to keep the more general concept of “human actions” since participation is much valued as positive, whereas actions could be both positive and negative (not supporting research and/or intervention).

- p. 9510, Section 3: the first paragraph for this section seems out of place. It leads with all the negative human (and animal) interventions in hydrological research, when the following conversation is much broader. Also, these negative aspects are mentioned again a few paragraphs later. I suggest starting this section on the second paragraph.

We will consider this suggestion, as it indeed is a central element of our reasoning. The reason we mentioned these negative aspects first was to introduce a bigger picture of what (could) happen in the field. From that point of view we then classify the events based on human and non-human actions. Therefore, we mentioned similar things

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in complete in a few paragraphs later and add the # notation to correlate with the tables/proxies.

- p. 9513. Again, there is a confusion between human and non-human disturbance in the research process. The paragraph starting on line 8 says “The implementation of the hydrological research was strongly correlated to social relations and aspects.” Ignoring for the moment that this sentence is unclear as worded, I interpret “social” to mean we are talking about human actions. The paragraph goes on to refer to elephants, fine sands, strong winds, etc. Need to focus on humans here or broaden scope of section to include all mishaps in the field (I suggest the former).

Again, we will consider this carefully, as this is a valuable suggestion. We wanted to first show a spectrum of the actual hydrological research disturbance. Therefore we started to classify the social aspects which actually could have been avoided to technical failures the least that we could have been avoided at all. However, we agree that the focus is still on humans. We will rephrase the sentences in this paragraph.

- p. 9523: First paragraph on this page is out of place in this section, belongs much earlier in paper.

This paragraph provides key issues (as the conclusion) that can be taken into account when discussing “be prepared for surprises” and as such the topics would be logical at this point in the paper. However, we acknowledge that the paragraph as is written would have a good place in an earlier section, which allows for a short reminder on page 9523.

Fig. 2: What do the thick black lines indicate?

The black lines indicate roads where some of the direction of some surface water flows are in line with these roads.

Fig. 3: Fonts are very small. Color-coding for wells 2 and 3 in lower right figure does not match the map.

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We will match the colors.

Fig. 8: This figure difficult to understand quickly. Need to color-code rainfall axis with rainfall bars to separate visually from NDVI presentation.

We will color rainfall in dark blue and NDVI difference in light green.

Figs 11-12: Can't these figures be combined into one?

We prefer to first show the available scale of participation (Fig 11) and then match it to our experiences (Fig 12).

Fig. 13: It would be helpful to show the differences in ratings between scenarios, perhaps as a third panel to the right. Reader can't easily evaluate the significance of switching between scenarios. What about ratings for scenario 1?

Currently, the differences are visible directly by looking at graphs that are side to side (Scenario 2 and 3). Those bars (expert judgment) that exceed the yellow dash line ("better understanding" or grade 8 to 8.5) are the ones that give more understanding. The overall comparison of Scenario 2 and Scenario 3 show that bars exceeded in Scenario 3 are more than Scenario 2. However, we will try and bring these differences out more clearly.

Scenario 1 is not shown in a graph since it is basically an assumption of the minimum requirement to achieve similar result as performed in the actual research. Thus, Scenario 1 is categorized as an initial condition of "a good understanding" (or grade 6 to 7.5).

Table 4-6: I don't see the value of these tables.

As much as hydrological data are shared, we wanted to share our action data. The value of these tables should be to have a clear timeline of what happened in the fields; events, our actions and interpretations. In other words, these are empirical proxies per case study. They could be included as annexes.

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Table 7: Need to define the meaning of the “+”, “+”, etc. symbols here as is done in text, and/or skip definition in the text altogether. I also don’t understand how these same symbols are used in the “Process” and “Model” columns, are these also monetary evaluations?

We filled in “+” etcetera following Blume et al. 2008. These evaluations provide quantifications in gaining the understanding of the certain hydrological process and the significant of measurement inputs for models. Thus the process and model are separated. For example in the Vietnam case, to understand the process of groundwater level increase due to contour trenching, the groundwater level measurement for the process understanding and model input are both of importance. However, in a study of the search on surface and groundwater interaction, groundwater level might not be an important input for the model.

Table A1: Need to define “+” symbol again is appendix tables appear separately from prior tables.

We will add the notes or meaning of “+”.

Tables A1-9: Need to include case study name in the titles.

We will do so.

Technical corrections

We will correct the text as suggested.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 12, 9489, 2015.

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