

Responses to Referee #1

We thank the Reviewer very much for the constructive and helpful review. Our responses to individual comments and suggestions for revisions are outlined below.

General comments:

This study reveals interesting results on farmers' perception and willingness / opportunity to adapt to climate change from a vulnerable region. The research questions are stated clearly. Though, the introduction contains repeating information and should be shortened. The conclusion section basically repeats arguments from the discussion. The concluding sentences are rather general and not closely connected to the findings. Here, the conclusion should be rewritten more concisely.

Answer: Thank you very much for your positive feedback. The introduction and conclusion section has been improved as per your suggestions.

Specific comments

p. 1361, I.3: what is meant by "yield", is it yield per area, overall production, or production per capita?

Answer: Here, yield refers to productivity measured in tons per hectare. This description has been included in the text to make it clear.

p. 1362, 2nd paragraph: This paragraph can be integrated into the previous text.

Answer: The introduction part has been improved and the mentioned paragraph has been integrated into the previous text.

p. 1362, I. 26-28: the information "and their adaptive behavior which is imperative to understand climate change adaptation in agriculture because farmers are the primary decision makers and stakeholders in the agriculture sector." Should be integrated into the previous text, where reasons for the importance of farmers with respect to climate change adaptation are given.

Answer: The introduction part has been improved and the mentioned paragraph has been integrated into the text mentioned in the comment.

p. 1363, 2nd paragraph: The research questions are clearly stated. But the information afterwards partly is a repetition of previous arguments. It should be shortened.

Answer: We revised the section and reduced repetitions as suggested.

p. 1369, I. 12: Why Zone D and not C?

Answer: Zone C is also an important zone to be considered but due to limited budget and time, it was not taken as study area. The reason for not selecting Zone C lies in its resemblance of some attributes with Zone D such as existence of Desert areas, crops grown in both areas and irrigation system prevailing in both zones.

p. 1369, I. 18-19: "based on the agriculture share to the total national economy, weather and climatic conditions, cropping patterns and irrigation networks in the area."

It should be explained whether a wide range of climatic conditions, cropping patterns, etc. was searched for or homogeneous conditions.

Answer: We tried to select areas with diversity in the above mentioned factors. For this purpose we searched the different agro-ecological regions. We also tried to get a good representation of the province regarding crop, irrigation system, climate etc. For example, Gujrat district belongs to the rain-fed region and is very different from the other two regions in terms of the cropping pattern and irrigation systems. Climate indicators also differ from the other two regions.

p. 1369, I. 20: Which criterion?

Answer: This question has been clarified in the revised text. We developed a criterion to select union-councils (UCs) for the sampling. In this criterion, first we excluded the urban UCs and in next step we randomly choose 20% of the remaining UCs as sample UCs.

Suggestion: I suggest to place section 3.2 before 3.1. so that the reader first understands the study region. Then, it is clearer, why the particular features were used to select the villages.

Answer: Your suggestion is sensible. Accordingly, we have shifted section 3.2 before section 3.1 as suggested.

p. 1371, I. 14-24: This paragraph repeats information from the introductions and partly from the methods section. It should be omitted.

Answer: We revised the section and reduced repetitions.

p. 1372, L. 22-23: "Overall decrease in responses from perception to adaptation stage was 29 %." Does that refer to 81% of all farmers perceived some kind of climate change (l. 12), but only 52% really adapt (81%-29%)? If so, this sentence should be corrected, because this is not a decrease by 29%, but a drop from 81% to 52%.

Answer: The sentence has been corrected according to your suggestion.

p. 1373, I.10: Why is renting out land an adaptation to climate change?

Answer: Renting out land is a relative severe adaptation measure. However, in the context of this study, renting out does not include fully renting out land to someone instead it means that due to climate variability or climate related risks, some farmers rent out some of their land to other farmers and do some off-farm activities. So it may be considered as adaptation to climate variability.

p. 1374, I. 4-7: "The major constraints identified by the majority of the respondents (Fig. 6) were the lack of information (44%) and lack of money (22%) followed by resource constraint (17 %), shortage of irrigation water (14 %) and other constraints (2 %)."

Were those constraints asked one after the other in the questionnaire, as is was a fully structured one? If so, it should be explained, why those constraints were chosen (pretest period for the questionnaire?).

Answer: We listed six to seven major constraints in the questionnaire. We first asked the farmers without giving particular choices. If farmers don't know the answer then we asked constraints explicitly one after the other.

These constraints were selected based on pretesting, literature review and previous studies on farm level adaptation or adoption of certain technologies. See following studies for reference;

Baumüller, H. Facilitating agricultural technology adoption among the poor: The role of service delivery through mobile phones. Working paper series 93. Center for Development Research, University of Bonn, 2012.

Bryan, E., Ringler, C., Okoba, B., Roncoli, C., Silvestri, S., and Herrero, M.: Adapting agriculture to climate change in Kenya: household strategies and determinants, *J. Environ. Manage.*, 114, 26–35, 2013.

Deressa, T. T., Hassan, R. M., Ringler, C., Alemu, T., and Yesuf, M.: Determinants of farmers' choice of adaptation methods to climate change in the Nile Basin of Ethiopia, *Global Environ. Change*, 19, 248–255, 2009

Hanif, U., Syed, S. H., Ahmad, R., Malik, K. A., and Nasir, M.: Economic impact of climate change on the agricultural sector of Punjab, *Pakistan Develop. Rev.*, 4, 771–798, 2010.

The pretest period for the questionnaire was 1 week.

p. 1374, I. 23-27, like p. 1374, I. 4-7 Figure 1: This figure appears in the introduction. But isn't it a result of this study? If so, it should be placed into the result section.

Answer: Yes the figure shows results of the study. It has been shifted to the results and discussion section as suggested.

Technical corrections

p. 1361, I.2: " food- insecure" -> "food-insecure"

Answer: corrected as suggested.

p. 1361, I.7: "has indexed" -> "has been indexed"

Answer: corrected as suggested.

p. 1363, I. 5-7: "i.e. how farmers perceive long term changes in surrounding climate and how they adapt their farming in response to perceived changes in climate?" -> "i.e. how do farmers perceive long term changes in surrounding climate and how do they adapt their farming in response to perceived changes in climate?"

Answer: corrected as suggested.

p. 1368, I. 6: "thee" -> "the"

Answer: corrected as suggested.

p. 1370, I. 5-6 "in selected union councils of three study districts of Punjab." can be omitted.

Answer: corrected as suggested.

p. 1372, L. 20-22: “As can be observed from the results, from perception stage to intention stage an 8.2% reduction was observed in responses while from intention stage to adaptation stage, responses of farm households were reduced by 22.6 %.” This sentence should be reformulated.

Answer: The sentence has been reformulated as suggested.

p. 1373, l. 2: “of 10–20 year“ -> “of the past 10–20 years”

Answer: corrected as suggested.

p. 1375, l. 25: “are having“ -> “had“ Figures 3, 4, 7, 8, and 9: The texts and numbers along the axes and inside the figures are too small.

Answer: corrected as suggested.

Thank you again for the helpful comments. – Authors.