Response to Reviewer Comments

Reviewer 3:

We sincerely appreciate the reviewer's comments. The followings are our point-by-point responses:

General comment:

In this paper (Estimation of Actual Evapotranspiration and Crop Coefficient…) . the authors have evaluated three methodologies for estimating ETo. But the objective and methodology is not clear. ETo measurements are mixed with actual evapotranspiration (AETc). The values of kc obtained by lysimeters should be applied to the FAO methodology (AETc = ETo * Kc) and an improvement of the PAN coefficient should be considered. In my opinion the work is interesting and can provide important information for management decisions and can applied in similar areas.

In my opinion, the work contributes to provide information on kc values on a regional scale, but could be improved clarifying some aspects of the methodology and providing a solution to the Kp values used (PAN method). See all comments

ABSTRACT:

- L.24-25. What is "viz."?.

Indirect methods "FAO Penman-Monteity equation and Pan Evaporation" estimate ETo, no actual evapotranspiration (AETc). Is the approach correct?

Response: *Thank you for your suggestion. We have made the required changes in the revised manuscript. Yes sir, AETc can be estimated by field experiments (Lysimeter, eddy covariance, remote sensing measurements etc). Whilem FAO PM and Pan Evaporation techniques gives* ET_0. *We calculate crop evapotranspiration using* ET_0 *and crop coefficient (Kc).*

- L. 26. FAO Penman-Monteity equation is referenced. Is it correct? It will not be FAO methodology by using FAO-PM?

Response: Thank you for your concern, sir. This is correct way to express the FAO Penman Monteith equation.

- L. 31-32. How were these estimates?

Response: *The obtained results for Kc values were higher than FAO Kc values. This is primarily due to the climatic condition in which FAO rice Kc developed. Our results were verified by different studies conducted around the world.*

- L 38. I think that "…can be applied to improve the irrigation scheduling".

Response: *Thank you for your suggestion. We have made change in the revised manuscript.*

KEYWORDS: words in the title should not be repeated

Response: *Thank you for your kind suggestion. We have replaced with appropriate keywords.*

INTRODUCTION:

- The introduction describes the general problem and relates it to the trial country. It may be too long, but it is correct.

- L. 94. Statements such as " provides exact measurement " should not be made. They are repeated throughout the document. It is a method that can offer more precision than others, but “exact measurement” is not true.

Response: Thank you very much sir. We have made the changes you suggested.

- L. 116-117. “…comparison of AETc and Kc values with indirect methods such as Penman-Monteith and Pan evaporation”. PM only estimate reference evapotranspiration.

Respon se: *Thank you very much for kind suggesti ons. In this paper, we have estimated actual evapotranspiration using modified non-weighing lysimeter and compared this methodology with commonly used indirect methods i.e Penman Monteith equation (used to estimate Reference evapotranspiration (ET0) and Kc*ETo gives ETc) and Pan Evaporation (used to estimate Reference evapoytranspirsation(ET0)by Kp*Pan Evaporation and then Kc*ETo gives Etc). Among various methods, the FAO Penman-Monteith method was found to have the lowest overestimation error (1%) and is widely known as the most reliable approach for estimating reference evapotranspiration [20,21]. However, lysimetric experiment in this region has not been studied. Therefore, we have compared the actual evapotranspiration estimated using non-weighing lysimeter with Penman Monteith. All the suggestions have been incorporated in the revised manuscript.*

Comments:

Methodology:

2.1. Site description

- Table 2. “Methods employed for estimation”. A reference is needed.

Response: *Thank you very much for your comment. We have incorporated your suggestions in revised manuscript.*

Comments:

2.3.1.. FAO Penman-Monteith equation

- It is widely known. one reference is enough, it is not necessary to express it.

Response: *Thank you very much for the suggestion. We have reduced the citations.*

2.3.2. Pan Evaporation approach

- - The important thing is to know the Kp and justify it.

2.4. Estimation of stage-wise crop coefficient

- How ETo was finally measured?
- How ETc was finally measured?
- Figure 3. I do not understand how “Kc” can be obtained from ETo (PM) and ETo (Pan evaporation). Where is ETc?

Response: *Thank you very much for your constructive comment. Here, we have calculated actual evapotranspiration and compared their values with indirect approach Penman Monteith and Pan approach. I agreed with your opinion that if we find the overestimation of Pan evaporation approach and suggested to improve the Kp values but to develop the revised Kp equation is itself research. That's why, we have only suggested that if we have used the pan evaporation approach then, we first need to revised the Kp values for more precise results. In this manuscript, we have estimated the actual evapotranspiration by recording daily water level changes within set of drums throughout the season. Then we have estimated reference evapotranspiration using Penman-Monteith equation and pan evapoiration (Kp* Epan). Then Kc_ actual was calculated by actual evapotranspiration estimated using non-weighing lysimeter and ETo by Penman-Monteith equation and Kc_Pan calculated by actual evapotranspiration estimated using non-weighing lysimeter and ETo by Pan evaporation approach.*

- ***comments***
  - *2.6. Water productivity and agro-meteorological indices*
  -
  - \- L. 235. "Base temperature of 10 ºC", why?
  - \-

Response: *Thank you very much for your comment.* We have taken 10 ºC as base temperature because in summer crops, based on lot of experiments by various researchers, it has been found that below this temperature, Crop could not perform its ideal growth.

- ***comments***

3. Results.

- Named Epigraph 3 as "Results" not as "Results and discussion".

Response: *Thank you sir. Section name has been revised as Results.*

3.1. Variation of reference evapotranspiration, water balance components and actual crop evapotranspiration

- Fig. 5. If ETo is being determined in both cases, it is normal that there are such marked differences. Is any method "difficult" to apply under the test conditions?
- 273-276. Pan coefficient must be improved.

Response: *Suggestions incorporated in the updated manuscript.*

3.3. Comparation of actual evapotranspiration with FAO PM and Pan Evaporation-derived 293 *evapotranspiration during crop period*

- Kc Values used by FAO method must be shown and justified. This method seems adequate.

Response: *Thank you for your suggestions. Here we have estimated actual evapotranspiration using modified non-weighing lysimeter and due to unavailability of any lysimetric studies in these regions, we have compared this method with most commonly used approach: Penman Monteith and pan evaporation. To develop the revised Kp equation is itself a research part, that's why we have only suggested to use pan evaporation only with caution.*

- *3.5. Influence of weather variables on Reference and actual evapotranspiration*
- - the contribution is scientifically irrelevant. it is already known.

Response: *Thank you very much for your comment.* We have agreed with your opinion, pattern is same but it differed slightly in various regions. Here, we have shown the significant contribution of weather variables influence on *Reference and actual evapotranspiration in these regions and correlation among these parameters.*

4. Discussion

4.1. Variation of reference evapotranspiration, water balance components, and actual 386 *evapotranspiration*

- **L. 388-397. In a scientific study, something must be contributed to solve it. For example, adjust the parameter. Is this possible?**

4.2. Comparison of crop evapotranspiration and stage-wise crop coefficients

- *L. 454-456. it should be explained how to improve it*
-

4.3. Influence of weather variables on Reference and Actual evapotranspiration

- *This is a direct relationship with ETo, I don't think it contributes anything to a scientific study.*

Response: Thank you very much for your comment. Every methodology has its pros and cons even lysimetric studies have itself their own limitations. Here we have shown that in unavailability of lysimetric studies, this methodology can be used and it provides the satisfactory results. Influence of weather variables on Reference and Actual evapotranspiration pattern is more or less similar and the scientific contribution is that we have shown the exact significant contribution and correlation among various weather variables as well as Reference and Actual evapotranspiration in the study region.

Conclusions:

- Conclusions section must be improved.
- L.484-490 are not conclusions. It is a general statement.
- L.494-496. It is a good conclusion. They are different of FAO Kc values. Kc Values are "general".
- L. 496-499. The reference should be to local estimates. This method is not suitable. Is there anything proposed to improve it?
- L. 502. why have they not been reviewed?
- The conclusions are interesting but should be reduced. The first part are not conclusions. The possibility of improving the bread coefficient should be highlighted.

Response: *Thank you very much for your critical suggestion. We have incorporated your suggestions in the revised manuscript.*