

This study was previously submitted to *Frontiers in Microbiology* (FiTM) and was rejected after critical reviews by two referees. Both reviewers are positive about the publication of this study in FiTM, although the comments are pretty critical, particularly reviewer#2. So the reason of rejection appears to be that the authors are not able to adequately address the concerns raised by the reviewers. Both reviewers are nice, despite of being somehow critical.

I have carefully read the comments and replies to the comments, and reviewed the ms myself. The manuscript could be published only after major revision suggested by both reviewers.

The key concerns are from reviewer#2, and I fully side with him/her. "Overall the text is too speculative- the discussion, although well written, is much too long with 10 pages, and especially the last 5 pages are full of speculation and partly wander too far from discussing actually measured data. It is impressive from how many different angles the authors try to shed light on their data, but when large parts of text end in hypothetical conclusions, assumptions, possibilities, it somehow makes the story implode back onto its core data, and it makes reading the long discussion a bit frustrating. I feel that the few interesting points could be summarized and put into necessary context in a much shorter way. I wonder whether the manuscript could be partly rewritten in order to focus more on the rates and less on the weak nifH data."

The major revisions should be made including:

- (1) Stay focused on what you want to say. The authors need to focus on N₂ fixation and productive water in this study, and get all relevant placed in the text first.
- (2) The figures and tables need to be re-structured.

In summary, the major re-structuring is required as following.

- (1) Table 1 might be useful, but table 2 can be placed in the supplementary text.

The key points includes:

- (1) N₂ fixation rate should be the figure 2, and primary production figure 3. Other figures are then arranged in an order to explain the N₂ fixation and primary production
- (2) In addition, Fig.7 and Fig.8 can be merged. Figure 4 and Figure 5 might be merged as well.
- (3) Figure 6 may not be appropriate in this study because it will be published somewhere else.

Other key concerns for example are the following

- (4) In the abstract, the table 1 was not mentioned which does not echo with the title "productive water"
- (5) Line 24 delete the phrase of (38.8–46.5° N; 8.0–19.7° W) in May 2014
- (6) L26-28. This statement is too descriptive
- (7) L28. Delete the phrase In agreement with previous studies,

- (8) L35-38. Please provide solid evidence, instead of proposing something.
- (9) L39-40. These data appear to be placed in the supplementary materials. Therefore, it is no appropriate to be discussed in the abstract.