Response to Reviewer 3 Comments

Dear reviewers,

Thanks for your comments and suggestions regarding the manuscript agronomy-1939589. We appreciate the Editor's and the Reviewers' contributions and believe that the paper is significantly improved. Following are our detailed responses to all of comments.

Point 1: Title: 1/ too long, too bold claim

Response 1: Yes, we have changed the title in a more concise and cautious language.

"Proper deficit nitrogen application and irrigation on tomato can obtain a higher fruit quality and improve cultivation profit" (Lines 4-5)

Point 2: Abstract: 2/ better follow the established schema of writing academic Abstract: A/ introduction (urgency and significance of the research hypothesis); B/ principles of the methods used + key results; C/ conclusions (commercial and environmental impacts)

Response 2: Yes, we have revamped the structure of abstract and addicted the introduction of research background at the beginning.

Point 3: 3/ reduce the use of abbreviations and technical terms, please understand that the purpose of the Abstract is to explain to all readers (including those from other disciplines) what the paper is about

Response 3: Yes, we have corrected the abbreviation to readable full name.

Point 4: 4/ there is no reason to go into detail and present the results obtained under specific reaction conditions, rather provide a synthesis of the results obtained

Response 4: Yes, we have deleted the results of detailed parameters and summarized the result succinctly. "The results showed that water and nitrogen deficit decreased plant growth, evapotranspiration and yield while increased production efficiency and fruit comprehensive quality." (Line 26-28)

Point 5: 5/ better highlight the urgency and significance of your work, clearly indicate who (and how) will benefit from these findings (explain the importance)

Response 5: Yes, we have defined the study was important to sustainable agriculture and it may most needed by famers in tomato cultivation.

The modified abstract is as follows:

"Faced with severe global shortage of water and soil resources, researches on the integrated effect of water and nitrogen on tomato cultivation are in urgent need for sustainable agriculture. Two successive greenhouse experiments with three irrigation regimes (1, 2/3, 1/3 full irrigation) and four nitrogen levels (1, 2/3, 1/3, 0 nitrogen) were conducted, plant growth, fruit yield and quality were surveyed, and comprehensive quality and net profit were evaluated. The results showed that water and nitrogen deficit decreased plant growth, evapotranspiration and yield while increased pro-

duction efficiency and fruit comprehensive quality. Antagonism effect from water and nitrogen application was found in tomato yield, organic acid, solids acid ratio, vitaminC and lycopene, whereas synergistic impact was observed in total soluble solids content. Water deficit had more significant effect on tomato yield and fruit quality parameters compared with that under nitrogen deficiency. Synthesizing the perspectives of yield, quality, resource productivity, market price index and profits, 1/3 full irrigation and 2/3 full nitrogen was the best strategy and could be recommended to farmers as an effective guidance for tomato production." (Lines 20-39)

Point 6: Introduction: 6/ remove all clusters of references to avoid reference overkill (always use only 1 reference to support 1 claim)

Response 6: Yes, we have checked the correspondence between each reference and claim to make sure the claim was clarified and duplicate papers with the same opinion were deleted. But there were situations that single reference can only demonstrate a part of one long sentence, for the convenience of continuous reading, I put all the quotations I used at the end of the long sentence.

Point 7: 7/ it should be better explained that N comes in different chemical forms, be more explanatory and deeper review the latest trends in nutrients recycling, refer to paper "Economic considerations on nutrient utilization in wastewater management"

Response 7: Yes, we have added the main chemical forms of plant nitrogen use and mentioned the pollution and the nitrate concentration in fruit question caused by over N use. (Lines 60, 61 and line 71)

Point 8: 8/ go straight to the point and more in depth, write more technically (always provide corresponding numbers), significantly condensate all the text by reducing ballast phrases and cliché

Response 8: Yes, we have changed the general summaries to specific reported number to support points. (Line 58-61)

Point 9: 9/ it should be better explained that interactions with other nutrients are also important, refer to paper "Economic impacts of soil fertility degradation by traces of iron from drinking water treatment"

Response 9: Yes, your comments were important and instructive, and we added the importance of other nutrients in discussion as a further research direction. (Line 408)

Point 10: 10/ make sure that this chapter fully introduces any reader into to the topic, explain all the terms, units, abbreviations and the whole context that is necessary for anyone (including experts from other disciplines) to understand the following chapters

Response 10: Yes, we have checked all the terms, units, abbreviations and contexts to make sure they're explained, definite and smooth.

Point 11: 11/ deeper review the interactions with soil/substrate, refer to paper "Techno-economic analysis reveals the untapped potential of wood biochar"

Response 11: Yes, we have added the interacted effect between fertigation and soil characteristic

in discussion as a deeper analysis about deficit fertigation and sustainable agriculture. (Line 409-410)

Point 12: 12/ the research hypothesis is not clearly stated, clearly justify the urgency and importance of its investigation, clearly identify those who will benefit from the findings
Response 12: Yes, we have rewritten research aims and explained that we expected there was an optimal deficit fertigation scheme to tomato cultivation. And farmers in tomato cultivation industry can take advantage of this study to improve their economic benefits. (Line 101)

Point 13: Materials and Methods: 13/ the method must be presented in such a way that it can be reproduced anytime, by anyone, anywhere (do not create obstacles like referring to specific location, season or time period etc.)
Response 13: Yes, the experiment can be reproduced in other place and other time. The position and climate information in experimental site was provided as a basic situation and for factorial analysis if the results of deficit fertigation experiment in other places are different. Besides water and fertilization, air temperature, solar radiation and soil characteristic are also important factors that effect plant growth.

Point 14: 14/ each material/reactant and apparatus used needs to be presented in detail (serial number, setup, process parameters, manufacturer, country of origin, purity etc.)
Response 14: Yes, we have added the details of each equipment and test kit.

Point 15: 15/ provide cost breakdown or at least some simplified financial analysis if you are about to argue that this concept is realistic
Response 15: Yes, we have added the cost of each item in 2.5 economic analysis. (Line 234-237)

Point 16: Results:16/ each Tab. and Fig. should be provided with caption that describes A/ what can be seen and B/ how is this relevant to the research hypothesis
Response 16: Yes, we check and corrected the captions of tables and figures.

Point 17: 17/ avoid data overkill, present only the most most industrially important results
Response 17: Yes, we have deleted some unimportant results and emphasized the most important result in each phase.

Point 18: Discussion:18/ show more self-criticism to your work (can all the methods and results be fully trusted? what are the weaknesses of the methods used? where do the main measurement inaccuracies arise? what are the limitations from a commercial point of view? are the lessons learned transferable to other fields?)
Response 18: Yes, we have added more criticism in discussion. ①The N content in final soil of each treatment was regrettably missing, and we can only know the nitrogen application amount rather the plant uptake amount. Although we can ensure nitrogen deficit was happened, the real deficit level of nitrogen was probably not consistent with the gradient we set. ②For the evaluation of comprehensive quality, subjective factors exist when using AHP to assign the weight to each

quality index. ③In economic analysis, the prices were only refer to local market (Shandong province, China), where the water and labor cost was relatively low and fertilizer cost was relatively high. And the final water and nitrogen application decision may not suitable to other places where the resources prices change too much. ④The irrigation engineering used in this study was drip irrigation in solar greenhouse, which was not available to all farmers, and specific experiment needs to conducted for other irrigation method such as traditional irrigation, spray irrigation. Because loss of water and fertilizer and fertigation efficiency are different in different irrigation forms. ⑤For deeper research, a molecular biology study is needed to find out the variances of hormone signals, key enzyme activities, active genes in plant when suffering deficit, and explain the inner mechanism of fertigation effect on plant. ⑥Since fertigation deficit also effect tomato maturity, the time to market was different between each treatment. A more particular economic analysis is needed to a sensitive market where agriculture production prices fluctuates wild.

Point 19: 19/ propose some improvements and direction for future research, refer to paper "Economic impacts of soil fertility degradation by traces of iron from drinking water treatment"

Response 19: Yes, as your instructive comments, we have added prospect of researches on the interaction among plant, soil matrix, water and fertility. (Line 407-410)

Point 20: 20/ compare your results in more depth with the existing literature, identify the main deviations and try to explain the mechanisms by which they may have been caused

Response 20: Yes, the most important point was that in this study, severe deficit with high quality and reduced yield was more acceptable cause quality took a role position in sales benefits compared with yield. And for other research yield was usually seem as the most important and must to be guaranteed.

Point 21: Conclusions: 21/ reveal the main driving mechanisms of your results, provide deeper synthesis and reveal some more original/significant findings

Response 21: Yes, we have summarized the key findings but it was very regret that we did not test inner physiological and biochemical changes in plants and can only make a phenomenal rather rooted conclusion.

Point 22: 22/ do not repeat your methods and results again and again, please understand that the Conclusion chapter is not a summary of your work, present only original and industrially significant revelations that have the potential to expand the horizon of human knowledge (higher level of generalization is mandatory)

Response 22: Yes, we have delated repetition and emphasized the momentous points that worthy further study.

Point 23: 23/ clearly indicate whether the research hypotheses tends to be confirmed or not

Response 23: Yes, there was a balance between tomato yield reduction and quality improvement, and we found a proper water and nitrogen application scheme that 1/3 irrigation and 1/3~2/3 nitrogen application.