

General Comments

I enjoyed reading the manuscript 'Impact of Cropping Systems on Macronutrient Distribution and Microbial Biomass in Drought Affected Soils', studied in Ananthapuram district of Andhra Pradesh, India. It is difficult to find the aims and objectives. I could say, the aim is to find the suitable cropping systems in drought prone soils.

One important concern is the standard of writing of the manuscript. I could say poor structure of sentences through out the manuscript. It requires restructuring the sentences for easy to read, clear and concise of the meaning and keep the bonding among the sentences in a paragraph and also paragraphs to sections.

Thank you for your general comments, I tried best to give the justification in all aspects.

Abstract

The abstract is to be clear and concise aligning with the title of the manuscript. it could be improved keeping in mind the classical structure of a good abstract.

Comment: L11-14 introductory sentence - how these lines are linked to the title. Rewrite the concept to link the objective or the gap of the previous research.

Justification: Thank you for your comment, comprehension of the elaborate relationship between water availability, soil nutrients, and microbial biomass is essential for improving plant growth and confirming soil health. Although surface microflora traditionally facilitates mineralization and nutrient cycling, the effects of drought on soil microbial biomass and nutrient utilization have yet to be fully investigated.

Comment: L14-16 objectives - I mentioned earlier about the objective. I could say that 'the objective is to compare the macronutrient distribution and microbial biomass in various land-use types i.e. open lands (OL), annual crops with single species (ACS), perennial crops with multiple species (PCM), less water available lands (LWA), and soil near ponds (CP) in drought prone soils'.

Justification: Thank you for your comment

Comment: L17-19 methods - poor sentence structure of methods. How these methods are linked to reach the objectives.

Justification: Thank you for the comment. Soil samples collected from different land types indicate that different land types allow for comparison and analysis of how land use practices influence macronutrient distribution and microbial biomass. The samples were air dried, indicating uniform processing and analysis across all samples because drying prevents microbial activity without altering the composition of the sample, and for a comprehensive analysis, the samples should be subjected to physical, chemical, and biological analysis. The overall methods adopted would give a thorough investigation of the impact of land use types on macronutrient distribution and microbial biomass in drought-prone soils.

Comment: L-20-21 data analysis – rewrite it. Overuses of the word 'employed' inappropriate sentence.

Justification Thank you for the comment; it can be changed to “ Statistical analysis, including ANOVA and Pearson Coefficient, were utilized to discern patterns across seasons, soil depths and microbial biomass.

Comment: L-21-31 Results – rearrange and rewrite the results to support the objectives, not only presenting the data.

Justification: Thank you for the comment; here is the rewritten version Statistical analyses, encompassing ANOVA and Pearson Coefficient, were utilized to determine patterns throughout seasons, soil depths, and microbial biomass. Microbial biomass carbon (C_{mic}) showed a range of 134.2±1.2µg/g to 286.6±1.33µg/g, while nitrogen (N_{mic}) and phosphorus (P_{mic}) explained variability from 11.3±1.3µg/g to 69.5±0.98µg/g and 07.6±1.5µg/g to 77.5±0.6µg/g, respectively, across all seasons. Furthermore, carbon stock in the upper soil surface positively affected nitrogen and phosphorus maintenance. Remarkably, perennial crops with multiple species (PCM) showed superior C_{mic}, N_{mic}, P_{mic}, and water-holding capacity compared to open lands (OL), less water available lands (LWA), and annual crops with single species (ACS). These findings emphasize the impact of diverse cropping systems, especially PCM, in improving microbial biomass and nutrient levels in drought-affected regions. The observed improvements in soil moisture, nitrogen, phosphorous, and potassium levels suggest that varied cropping systems can effectively enrich soil nutrients and biomass content under drought stress. In conclusion, our study highlights the potential of perennial crops with multiple species in mitigating the impact of drought on soil microbial biomass and macronutrient distribution across different land-use types in drought-prone soils

Comment: L-21-23 Results – Is Microbial biomass carbon (C_{mi}) the main parameter that helps to test the r hypothesis/ gain the r objectives. If not, present the indicative parameter.

Justification: Thank you for your comment. One of the important parameters in assessing the impact of different cropping systems on microbial biomass and macronutrient distribution in drought-affected soils is that it may not necessarily be the sole parameter, but C_{mic}, N_{mic}, and P_{mic} also play a major role in nutrient uptake. Multiple parameters allow for a more comprehensive assessment of soil functioning and the impact of cropping systems on soil health. Along with soil microbial biomass carbon, N_{mic}, and P_{mic} will help in understanding soil functioning and cropping systems

Comment: L-24 - Carbon stock – how it influences? Provide data.

Justification: Thank you for your comment, the upper layers of carbon stock has a positive influence on nitrogen and phosphorus retention in drought affected soils, thereby contributing to the objective of assessing the impact of different cropping systems on nutrient distribution and microbial biomass.

Comment: L-27-29 Results – is this the main outcome of the r research to gain the objective? Rewrite.

Justification: The conclusions indicate that diverse cropping systems have a knowing influence on soil nutrient levels and biomass content under drought stress. This highlights the potential of varied agricultural practices to enhance soil health and productivity in drought-affected environments, aligning with the objective of evaluating the impact of different cropping systems on microbial biomass and macronutrient distribution.

Comment: L-30-31- Outcomes – is this repetitive to the previous sentence.

Justification: Thank you for your comment. The lines 27 to 31 can be rewritten as These findings underline the potential of diverse cropping systems, particularly perennial crops with multiple species, to mitigate the impact of drought on soil microbial biomass and macronutrient distribution. This contributes to our understanding of sustainable agricultural practices in drought-prone regions and highlights the importance of applying such systems to increase soil health and resilience.

Comment: L-31-33 Outcomes – I could not find “sustainable agricultural practices’ used in the other sections of the manuscript, except abstract and conclusion. How does the present research contribute to the concept of ‘sustainable agricultural practices’ ?

Justification: Thank you for your comment, here is the justification. The present study contributes to sustainable agricultural practices by emphasizing the effectiveness of perennial cropping with multiple species in mitigating the impact of drought on soil microbial biomass and macronutrient supply. Perennial crops with diverse species enhance soil health and resilience by promoting biodiversity, improving soil structure, and reducing dependence on external inputs like fertilizers. This approach forwards long-term soil fertility, water retention, and ecosystem stability, aligning with sustainable agriculture principles. By determining the benefits of such cropping systems in drought-prone regions, the study offers practical insights for promoting sustainable land management practices that balance productivity with environmental conservation.

Comment: L-33 Outcomes – The findings of the resent study (diverse cropping systems) could be useful in the drought-prone soils in other regions to gain higher crop productions.

Justification: Thank you for your comment; yes, we believe in the study that has been conducted.

1. Introduction

Comment: I-36-39 – This sort of sentence structure is used all-around the manuscript. These are not easy to read and understand and free flow of the topic. Please rewrite these sentences to make it concise and clear meaning.

Justification: Thank you for your comment, the line 36-39 emphasizes the importance of microbial biomass as a key indicator of soil health. Microbial biomass is essential for maintaining organic content in the soil through the decomposition of organic matter. This process is vital for controlling nutrient cycling and sustaining biogeochemical processes in various ecosystems. In essence, the line-36-39 highlights how microbial biomass influences the fertility and functionality of soils by regulating the breakdown of organic materials and facilitating nutrient availability for plants and other organisms

Comment: Paragraph structure- make a topic sentence followed by the relevant information.

Justification: Thank you for your comment, the introduction outlines several important aspects related to microbial biomass, soil health, and the impact of agricultural practices on soil fertility in drought-affected regions. It discusses the essential role of microbial biomass in maintaining organic content, controlling nutrient cycles, and sustaining biogeochemical processes in ecosystems.

Comment: Research gap – discuss the relevant topics in introduction and narrow down into the research gap. Link the research gap with the objectives of the present study.

Justification: Thank you for your comment; here in this study, we have found there is a lack of studies examining the microbial biomass in different cropping systems in drought-hit regions and their relationship with soil nutrients. Though the soil microbial biomass and nutrients are important in maintaining soil health, there is a lack of research focusing on the aspect in the study area that is Andhra Pradesh, so there is a need to investigate how different cropping systems influence soil microbial biomass and nutrient levels in drought-hit soils.

Comment: L-82-84 - Findings in introduction? Without knowing the results of the research, how will a reader link/ accept the suggestion /the finding. Better, Remove it.

Justification: Thank you for your comment, but lines 82-84 describe an overview of the study objectives and scope. Here is the modified version: A study has been taken to investigate the impacts of different cropping systems on soil microbial biomass in drought-affected regions. It is aimed to explore various factors, which include soil depths, seasonal variation, and nutrient composition. By understanding these aspects, the study sought to enhance our understanding of how different cropping systems influence soil microbial communities in environments prone to drought stress.

Comment: Fig-1: is it relevant with the r research? It was not mentioned anywhere in the text. Fig-1 could be referred in L-80, L-91 or L-101. Place Fig-1 in appropriate location following the text.

Justification: Thank you for your comment; the figure has been placed in line 80.

1. Material and Methods

Comment: 2.1 Study area and Climatic conditions -shows 5 different land uses.

Justification: Thank you for your comment; yes, the study area comprises it.

Comment: 2.2 Collection of Soil Samples – defines 10 sampling sites.

Justification: Thank you for your comment; yes it is true

Comment: Fig-1 shows 10 sampling sites at Ananthapuram district of Andhra Pradesh, India. How these 10 sampling sites are related to 5 different land uses. The 10 sampling sites were not discussed anywhere except in Fig-1 and section 2.2.

Justification: Thank you for your comment; these 10 sampling sites were related to five different land use systems; from each system, two sites were picked for the study.

Comment: L-101-104 – a very long sentence. Poor sentence structure.

Justification: Thank you for your comment, it has been restructured in this way: Soil samples were randomly collected from ten distinct regions at the study site across three seasons: summer, monsoon, and winter. Samples were obtained from varying soil depths, including the upper surface (0-15 cm), subsurface (15-30 cm), and deeper layers (30-45 cm). Upon collection, soil samples were placed in Ziplock bags and transported to the laboratory for further analysis. Subsequently, the samples were air-dried and divided into three sub-samples for subsequent analysis of various soil characteristics.

Comment: L-105- why 3 sub-samples?

Justification: Thank you for your comment: Three sub samples indicate, triplicates of the sample collected.

2.3 Soil Analysis

Comment: L-107-112 – which methods were selected for analysing physical parameters and chemical properties?

Justification: The soil particle composition was then determined by weight, following the method outlined by Misra (1968). Bulk density has been determined using a specialized metal core sampling cylinder with a known volume. The soil moisture content has been calculated gravimetrically by subjecting soils to drying until reaching a constant weight, then expressing the water content as a percentage of the dry weight.

Comment: L-113 – check the tense

Justification: Thank you for your comment, the statement has been reframed as soil microbial analysis is estimated by taking the surface soils, as the activity of microbes is expected to be higher in the surface soils.

1. Results

- Physicochemical characteristics

Comment: L-121 – is not results. It could be in methods sections (2.4 Statistical Analysis).

Justification: Thank you for your comment. Line 121 gives information about the physicochemical analysis of results.

Comment: L-122-126 – references?

Justification: Thank you for your comment. Soil texture provides valuable insights into soil genesis and processes, which includes the composition of the parent material, weathering processes, and soil formation mechanisms; while similar textures may indicate some degree of geological similarity, in some cases might not conform with the same parental rock. In the case of microaggregates and pedogenic oxides, it may alter the distribution and composition of soil particles, including a fraction of sand, aggregation, and mineral weathering.

1. Discussion

In discussion, the manuscript contains several concepts, which could be presented in Introduction to find the research gap and link the objectives with the gap. In discussion, relate the results to establish the objectives. It could be referred or refuted arguments using other references.

Comment: L-178-201 could be used in Introduction to link the research gap with the objectives of the present study.

Justification: Thank you for your comment; lines 178 to 201 give the importance of soil ecology, nutrient richness, and the impact of drought on soil properties, which has been demonstrated in the results segment, the findings of soil parameters, cropping systems, and their impact on soil microbial biomass has been clearly mentioned, these were also been mentioned in the introduction.

Comment: L-211 -286 very long paragraph. These could be break down into several paragraphs, attaining these objectives.

Justification: Thank you for the suggestion, it will be well taken

Comment: L-248-258 are the introductory concepts, that be presented in Introduction. It is not worthy to new present concept. It could be used as reference for referring or refuting the arguments/ the present results.

Justification: Thank you for your comment; I have just reframed the statement to The significant variation observed in microbial biomass across different cropping patterns underlines the understanding of soil microbial communities to environmental changes induced by agricultural practices (Wang et al., 2018). These changes can affect microbial biomass levels not only in surface soils but also in deeper soil layers, reflecting the intricate relationship between soil environmental patterns and microbial dynamics. The microbial biomass plays a critical role in maintaining the chemical cycling and physical properties of soil, serving as a sensitive indicator of soil health and fertility (Rice et al., 1997). Optimal conditions promote microbial biomass homeostasis; however, deficiencies or excesses of essential nutrients like nitrogen, carbon, or phosphorus can disrupt this balance, leading to noticeable limitations or over-saturation of microbial populations. The recorded ranges of C_{mic} has in a series of $134.2 \pm 1.2 \mu\text{g/g}$ to $286.6 \pm 1.33 \mu\text{g/g}$ for all seasons, N_{mic} recorded $11.3 \pm 1.3 \mu\text{g/g}$ to $69.5 \pm 0.98 \mu\text{g/g}$ and P_{mic} has in the range of $07.6 \pm 1.5 \mu\text{g/g}$ to $77.5 \pm 0.6 \mu\text{g/g}$ in three seasons and cropping systems highlight the dynamic nature of soil microbial biomass in response to agricultural practices.

Comment: L-252 -253 – very poor sentence.

Justification: Thank you for your comment, and it is rewritten as Optimal conditions promote microbial biomass homeostasis; however, deficiencies or excesses of essential nutrients like nitrogen, carbon, or phosphorus can disrupt this balance, leading to noticeable limitations or over-saturation of microbial populations.

Comment: L- 254- 255 – reference??

Justification: Thank you for your comment. It is the observation of Rice et al 1997 which has been given in the reference.

1. Conclusion

As I understood, it was a comparative study among land uses in drought prone areas.

Rewrite the conclusion that the objectives were achieved. It is not worthy to present several new concepts in conclusion without discussing in results and discussion. For example, root system, perennial crops and or sustainable crop productivity.

Justification: Thank you for your comment, in the study perennial crop with multiple species showed a significant availability of nutrients and soil microbial biomass, so it has been mentioned as the root system of perennial crops could be a solution for drought hit soils.

Comment: L-310-313 could be the last sentence of the manuscript.

Justification: Thank you for your comment. It is well taken, but lines 313 to 316 have given how the selection of PCMs could be effective in drought-hit soils.

Additional comments

The manuscript requires a major change/ restructuring in presenting the results. Keep in mind that the literature reviews will be presented in Introduction, to find a research gap, which could be the aims of manuscript. The aims will be achieved by several objectives. To gain the objectives, the appropriate methods will be followed. The data/ results will be presented to achieve each objectives, finally, the aims of the manuscripts.

Using personal pronoun 'we', 'our' very frequently through the whole manuscripts, which is uncommon in international journal. It requires to edit through the article.

Justification: Thank you for your comment, well taken.