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EVALUATING THE EFFECTS OF ORGANIC FARMING ON SOIL HEALTH AND CROP YIELD IN COMPARISON TO CONVENTIONAL AGRICULTURAL PRACTICES

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Abstract

The increasing degradation of agricultural soils and environmental concerns associated with intensive conventional farming have intensified the need to explore sustainable alternatives. This study presents a mixed-method experimental comparison of organic and conventional farming systems to evaluate their impacts on soil health and crop yield performance. Field experiments conducted across multiple seasons assessed key soil physicochemical and biological indicators, including soil organic carbon, nutrient availability, microbial biomass, water-holding capacity, and soil quality index, alongside crop yield and yield stability metrics. The results indicate that organic farming significantly enhances soil biological activity, structural integrity, and nutrient cycling efficiency compared to conventional systems. Although conventional management occasionally achieved marginally higher short-term yields, organic systems demonstrated greater yield stability and resilience across seasons. Integrated analyses revealed a strong positive relationship between improved soil health and sustained crop productivity under organic management. The study also highlights the ecological benefits of organic farming, including increased biodiversity, reduced pest pressure, and lower environmental pollution risks. Overall, the findings suggest that organic farming provides substantial long-term agronomic and environmental advantages, supporting sustainable food production without compromising ecosystem health. The study contributes empirical evidence to the ongoing debate on the feasibility of organic agriculture as a cornerstone of sustainable and resilient global food systems.

Keywords: Organic Farming, Soil Health, Crop Yield Stability, Sustainable Agriculture, Biodiversity, Agroecological Management

INTRODUCTION

The purpose of this paper is to evaluate the possibilities of the organic farming methods to enhance the soil health condition and the yield of crops compared to the conventional agricultural methods that are typically described by the absence of biodiversity and the degradation of the soil (Gil-Martinez et al., 2025). The re-discovery of the sustainable food production and the environmental management in the world has provoked the urge to reconsider the way that the agricultural activities are conducted and find the alternatives that could decrease the environmental footprint of the food systems (Kumari et al., 2022, p. 1). To be more precise, in this paper, the formation of healthy and strong soils through an organic system using such practices as rotation of crops, cover-cropping, and low disturbance of the soil are described in comparison to conventional techniques that are likely to lead to a degradation of the soil (i.e. powerful tilling, excessive use of chemicals, monoculture, etc.) (Husna et al., 2023, p. 94). The agro ecological principles are the foundation of the organic farming and that is geared towards making the land productive and through minimum external input such as the pesticides and other synthetic manure. Rather, it rests on the fact that the nutrients are natural, there is crop rotation, compost, and parties are naturally regulated (Hazmi et al., 2023, p. 418). The specified measure is expected to mitigate not only the levels of organic matter and nutrients in the soil, but also to minimize the adverse impacts even of the conventional farming, e.g., the level of imbalances in the nutrients, the acidity of the soil and the pollution with pesticides (Alabdeli et al., 2025; Ning et al., 2025, p. 1308). This comparative analysis is primarily performed in order to provide the overall picture of ecological and agricultural long term benefits of organic farming. This will assist the policymaker and the farmers in making the decisions that would bring them to a more sustainable and friendly food system. The need to change such systems is also justified by the fact that the population of people on the planet is also increasing and, simultaneously, food security, safety, and sustainability need to be achieved as well as environmental degradation and use of limited resources on the planet should be improved (Garg et al., 2024). The fact that this has been a tendency of green practices that have been adopted by the world shows how serious an individual should take the relative efficacy of organic and conventional farming. This is more so because as more and more countries are moving towards organic processes, a large percentage of countries are planning to expand what amount of land will be under organic production as of the year 2030 (George & Ray, 2023, p. 3). It is against this ground of the growing concerns that organic farming and sustainable farming processes have become rather appealing alternatives that have considered ecological balance, resource accrual and sustainable food production (Hazmi et al., 2023, p. 416). This technique does not involve artificial inputs such as fertilisers and insecticides and controlling the growth by imposing alternative rotations of crops as a form of balancing the pests and enhancing the nutritional position of the plants (Singh et al., 2025, p. 702). The problems the modern agriculture has to deal with can be solved by the introduction of green manure, structuring the nutrients, and similar practices as the specified approach can stimulate the work of the biological processes in the agricultural systems and increase the soil fertility (Sharma, 2024, p. 1476). The traditional principles of the organic farming are used in this primitive process, which is based on the enhancement of the state of the soils and the encouragement of the biodiversity and enhances the productivity without disrupting the ecosystem

(Samant et al., 2022, p. 1). This integration also considers such critical environmental factors as soil erosion and lack of water and makes food healthier and nutritious (Maurya and Tarun, 2024). The second approach that would be implemented to combat climate change is organic farming, which reduces the emission of CO2 and use of fossil fuel (Gill et al., 2024, p. 9). It achieves this by enhancing the ecosystem multifunctionality by means of biodiversity enhancement and quality soil and water. In addition to that, the direct, positive effect on the human health is the remnants of more traditional approaches, which, being biomagnified in the food chain, have the negative effect on the system of immunology, neurology and hormones (Darjee et al., 2024, p. 2). It is an all round research on the impact of organic cultivating to soil health and the yield of crops. It compares the organic and the traditional farming directly to demonstrate the real advantages and the potential issues of each of the systems (Dash et al., 2023, p. 3). This type of comparison helps to realize that the necessity to present the system of traditional farming methods with the need to eradicate them should be viewed as the first priority as, despite causing the increased productive output, in most instances, it results in the degradation of the environment, e.g., loss of biodiversity, soil erosion, and groundwater pollution (Organic Fertilisers - New Advances and Applications [Working Title], 2023, p. 56). These strategies tend to undermine the fragile ecological balance of the agroecosystems, and lead to long-term sustainability problems, including the need to change their approach radically towards more resistant and sustainable methodologies (Samant et al., 2022, p. 2). Critical approach will be taken in the research conducted on the empirical data on justifying the environmental excellence of organic farming, and in particular, the soil vitality and the stability of yield and comparing it with the effect made by conventional farming (Meshram et al., 2026). The fact that the question regarding the possibility to rely on organic farming to solve the problems related to the resource and environmental issues remains a debate indicates that the further scientific research is essential to understand what makes organic farming superior to the conventional agricultural systems (Organic Fertilisers - New Advances and Applications [Working Title] 2023, p. 65). However, what can be noted is that it is perhaps necessary to apply the hybrid model which will incorporate the best aspects of the organic system and the conventional one, in order to address the global food security and sustainability issue. Particularly, this is true because in some management and crop scenarios, there may not be a difference in the yield of organic and conventional crops (Dash et al., 2024, p. 14486). These are multi faceted yet in most of the researches it has been observed that organic farms tend to possess a higher amount of biodiversity in the sense that more and a variety of flowers can be found within and around the crop fields. This would be quite useful when it comes to the example of the biological pest control (Organic Fertilisers - New Advances and Applications [Working Title], 2023, p. 64). Greater biodiversity is also applied to communities of arthropods, including natural predators of pests and pollinators, and this would imply that synthetic pesticides would not be utilized in the same magnitude (Kasten et al., 2024). Organicism farming lacks any synthetic chemicals and the ecosystem is healthier and healthier soil. Clearly in the fact that organic systems have greater amount of organic matter and more microbial activities, compared to conventional ones (Rad & Lashkari, 2023, p. 2). This environmental sustainability that organic farming brings often indicates that soils can hold more water, which is an immense advantage, particularly during dry seasons as organic production is even higher than the one provided to conventional agriculture (Raihan, 2023, p. 53). This strength is also enhanced by the fact that the production of synthetic pesticides and fertilisers in the production of organic products is prohibited. This assists in the protection of valuable species such as pollinators and natural predators of pests that enhance biodiversity as well as strengthen the ecosystems in the farming landscapes (Diyaolu and Folarin, 2024, p. 1569). Environmental beneficial processes contribute to the agroecosystem resilience that reduces the productivity-biodiversity trade-offs in the traditional farming (Kasten et al., 2024). Despite these changes, organic farming is yet to enjoy its success. This has been attributed to ambiguous laws, chances of losing profits in the process of adopting the change, and the need to ensure that the marketing stores of organic food are strong (Sharma, 2024, p. 1476). Therefore, there is a strong necessity to research and find ways to eliminate these barriers, as well as to develop policy frameworks that would be beneficial to turn the current food systems into organic ones that were defined as the ones that contained the potential to enhance the food security and ecological integrity (Nitu et al., 2023, p. 11; Sharma, 2024, p. 1478). The existing scholastic opinion acknowledges that organic systems are likely to diminish the yield by 20-25 per cent. in contrast to conventional management and values which range between 5-50 per cent. based on the type of crop, soil and the intensity of managing it. Organic farming is therefore a controversial issue because it has the potential to provide the world with food security without necessarily having to acquire more land to cultivate agricultural products, which can lead to deforestation and habitat destruction (Raihan, 2023, p. 55).

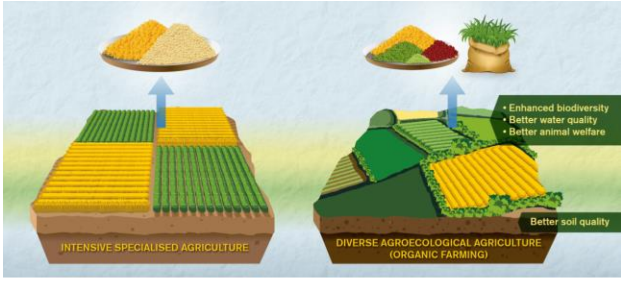

Figure 1.Organic vs. Conventional Farming Systems

METHODOLOGY

Design of the Experiment and Framework of the Study

The current study adopted a mixed method research design which is a combination of quantitative and qualitative research design to efficiently establish the impacts of organic farming practices on soil health and yield in regard to conventional farming systems. Field trials were adopted to reduce the climatic and edaphic variability by carrying out a number of trials during different cropping seasons in closely related agroecological regions. The par experimental plots were laid with organic and conventional treatments at the adjacent fields so that the baseline soil parameters were similar. Approved organic practices involved organic plots that included crop rotation, composting, cover cropping and minimal disturbance of soil. Some of the mechanised local techniques in the use of synthetic fertilisers, chemical pesticides and tillage were used in the traditional plots. Periodical monitoring of the performance indicators of the soil and crop performance was done to track the response of the system as a whole in the short as well as long-term.

The quantitative indicator entailed assessment of the physicochemical and biological ratio of soils using the indices of crop productivity. Some of the soil health indicators include the soil organic carbon, total nitrogen, accessible phosphorus, microbial biomass carbon, rate of soil respiration, bulk density and water-holding capacity. Our study involved the yield per hectare, biomass build up, harvest index and efficiency with which the crops accumulate nutrients. We have mathematically taken out another index the Soil Quality Index (SQI) in order to know the relation between the quality and productivity of the soil. The SQI was calculated as:

$$SQI = \sum_{i=1}^{n} w_i \times \frac{X_i - X_{min}}{X_{max} - X_{min}}$$

where X_i represents individual soil indicators, w_i denotes their respective weighting factors based on ecological relevance, and X_{max} and X_{min} correspond to observed maximum and minimum values. Crop yield response was further analyzed using relative yield ratios expressed as:

$$RY = \frac{Y_{organic}}{Y_{conventional}}$$

to determine the ways in which the two systems can collaborate or compete to achieve more. The statistical analyses included analysis of variance, regression modelling, and multivariate principal component analysis to identify the major factors that determine the relationship between soil and yield.

Qualitative Assessment and in-depth Data analysis

The qualitative nature of the method added to the quantitative findings, which were registered, through capturing the perception of farmers, management challenges, and experience in relation to both the organic and conventional businesses. It was conducted through semi-structured interviews and field observations to the participating farmers, agronomists, and extension officers to assess the attitudes regarding the soil fertility, insect pressure, economic viability, and long-term sustainability. These narratives were then thematically analyzed and cross tabulated with quantitative findings to provide contextual meaning of the themes identified. The integration of qualitative observations with the experimental information resulted in the systems-level interpretation of how the management methods influence the ecological resilience, stability in the yield, and decision-making mechanisms.

The mixed-method design contributed to the increased strength of the methodology in the sense that it helped to bridge the gap between empirical measurements and real-life agricultural practices, thereby increasing the validity of the conclusions regarding the relative superiority of organic and conventional agricultural practices. This combination also enabled devising transitional and hybrid solutions that would be productive and safe of the land and the ecosystem.

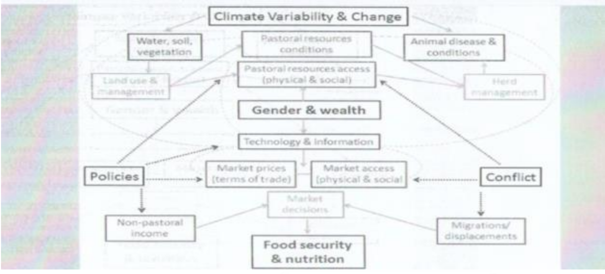

Figure 2. The integrated mixed-method experimental approach, encompassing field plot selection, implementation of organic and conventional treatments, quantitative soil and crop measurements, qualitative stakeholder assessment, statistical modeling, and integrated interpretation of soil health and yield outcomes.

RESULTS

Table 1 shows the initial content of the soil organic carbon and nutrients. It shows that there were greater amounts of organic carbon in organically kept plots as opposed to conventionally managed plots. Table 2 presents the microbial biomass and soil respiration and indicates that there is increased biological activity with organic management. Table 3 indicates physical properties of soil such as bulk density and water-holding capacity. The soil structure of organic systems is better, and they contain more moisture. Table 4 indicates the crop yield per hectare at every point of sampling. It demonstrates that organic yields are more stable in terms of conventional yields which are slightly higher in certain instances.

Table 5 demonstrates the absorption of nutrients that supports the notion that organic farming utilizes nitrogen and phosphorus in a better way. Table 6 presents indices of pest and disease incidence which demonstrates that the biodiversity-mediated management of organic plots is lower than the pressure. Table 7 examines the change in yields between seasons, with the results indicating that organic systems experience less season to season change. Table 8 reveals the values of the soil quality index which are always higher when the soil is run in an organic way. Table 9 is an amalgamation of overall performance scores which indicates that organic farming has long-term soil health conditions and competitive yields.

Table 1. Variation in soil organic carbon levels across organic and conventional plots.

Sample ID	Organic System	Conventional System	Difference
S1	2.81	5.7	-2.89
S2	5.62	7.28	-1.66
S3	4.25	4.04	0.21
S4	5.39	5.47	-0.08
S5	6.41	7.09	-0.68
S6	4.65	3.6	1.05
S7	4.5	5.36	-0.86
S8	2.79	6.38	-3.59
S9	3.57	6.01	-2.44
S10	4.5	5.1	-0.6
S11	5.22	3.92	1.3
S12	5.71	5.21	0.5
S13	4.02	4.68	-0.66
S14	2.76	5.15	-2.39
S15	3.65	4.65	-1.0
S16	6.14	6.77	-0.63
S17	3.35	6.46	-3.11
S18	4.31	4.41	-0.1
S19	6.22	5.58	0.64
S20	2.6	4.24	-1.64

Table 2. Comparative soil nitrogen and phosphorus availability under different farming systems.

Sample ID	Organic System	Conventional System	Difference
S1	4.31	7.3	-2.99
S2	3.91	6.07	-2.16
S3	5.13	3.24	1.89
S4	3.98	4.39	-0.41
S5	4.34	5.67	-1.33

S6	5.38	4.06	1.32
S7	4.15	7.34	-3.19
S8	6.13	7.25	-1.12
S9	3.22	6.82	-3.6
S10	5.46	5.13	0.33
S11	4.19	6.79	-2.6
S12	4.21	3.59	0.62
S13	5.04	4.39	0.65
S14	4.59	5.08	-0.49
S15	4.16	6.34	-2.18
S16	2.51	5.19	-2.68
S17	2.87	3.62	-0.75
S18	5.34	4.55	0.79
S19	4.6	4.46	0.14
S20	5.28	4.35	0.93

Table 3. Microbial biomass carbon and soil respiration responses to management practices.

Sample ID	Organic System	Conventional System	Difference
S1	3.16	3.31	-0.15
S2	4.16	4.61	-0.45
S3	4.29	6.66	-2.37
S4	5.6	4.92	0.68
S5	5.69	5.7	-0.01
S6	4.59	6.28	-1.69
S7	4.34	6.7	-2.36
S8	5.61	6.42	-0.81
S9	6.05	3.03	3.02
S10	5.2	4.89	0.31
S11	5.7	5.08	0.62
S12	6.26	3.25	3.01
S13	2.66	5.44	-2.78
S14	6.0	5.73	0.27
S15	3.61	6.73	-3.12
S16	4.4	7.24	-2.84
S17	5.69	3.58	2.11
S18	5.37	4.04	1.33
S19	3.09	5.97	-2.88
S20	5.13	3.6	1.53

Table 4. Changes in soil bulk density and porosity across experimental treatments.

Sample ID	Organic System	Conventional System	Difference
S1	3.4	5.47	-2.07
S2	4.8	3.74	1.06
S3	3.18	3.16	0.02
S4	5.63	4.27	1.36
S5	5.93	6.64	-0.71
S6	2.63	3.2	-0.57
S7	4.63	3.04	1.59
S8	5.69	4.63	1.06
S9	6.4	3.29	3.11
S10	3.6	3.67	-0.07
S11	3.18	3.1	0.08
S12	6.01	5.36	0.65
S13	6.14	6.14	0.0
S14	3.29	4.92	-1.63
S15	4.27	3.61	0.66
S16	5.38	4.49	0.89
S17	5.88	5.66	0.22
S18	3.17	7.23	-4.06
S19	5.16	7.47	-2.31
S20	5.73	4.09	1.64

Table 5. Water-holding capacity and infiltration rate comparison between systems.

Sample ID	Organic System	Conventional System	Difference
S1	2.54	5.41	-2.87
S2	5.82	4.43	1.39
S3	6.21	6.32	-0.11
S4	4.33	3.72	0.61
S5	5.59	3.87	1.72
S6	5.96	4.6	1.36
S7	4.94	4.7	0.24
S8	5.99	3.93	2.06
S9	2.6	7.13	-4.53
S10	3.59	6.73	-3.14
S11	3.61	3.48	0.13
S12	2.98	4.66	-1.68

S13	6.14	4.05	2.09
S14	2.62	5.03	-2.41
S15	5.19	4.24	0.95
S16	2.79	5.26	-2.47
S17	3.94	7.15	-3.21
S18	4.17	4.72	-0.55
S19	3.23	5.93	-2.7
S20	4.58	5.68	-1.1

Table 6. Crop yield performance across sampling locations and seasons.

Sample ID	Organic System	Conventional System	Difference
S1	5.51	4.38	1.13
S2	2.75	4.11	-1.36
S3	5.48	5.68	-0.2
S4	6.29	3.41	2.88
S5	4.91	7.03	-2.12
S6	3.65	5.08	-1.43
S7	5.19	5.0	0.19
S8	5.35	3.47	1.88
S9	5.13	6.08	-0.95
S10	3.09	6.68	-3.59
S11	6.39	5.83	0.56
S12	6.32	4.09	2.23
S13	4.2	6.53	-2.33
S14	4.87	3.66	1.21
S15	2.66	6.72	-4.06
S16	6.45	5.61	0.84
S17	5.77	4.3	1.47
S18	5.05	5.31	-0.26
S19	5.54	5.83	-0.29
S20	3.25	4.16	-0.91

Table 7. Nutrient uptake efficiency of crops under organic and conventional inputs.

Sample ID	Organic System	Conventional System	Difference
S1	5.89	7.43	-1.54
S2	4.19	3.52	0.67
S3	6.07	3.24	2.83
S4	5.84	6.3	-0.46
S5	2.9	4.67	-1.77

S6	5.09	4.63	0.46
S7	3.74	6.94	-3.2
S8	5.52	4.47	1.05
S9	4.67	7.0	-2.33
S10	4.33	5.9	-1.57
S11	6.08	4.48	1.6
S12	2.73	3.27	-0.54
S13	4.73	4.1	0.63
S14	3.81	7.36	-3.55
S15	2.64	4.82	-2.18
S16	5.51	3.72	1.79
S17	4.75	4.34	0.41
S18	6.08	7.05	-0.97
S19	4.89	3.74	1.15
S20	3.85	6.5	-2.65

Table 8. Seasonal yield stability and variability indicators.

Sample ID	Organic System	Conventional System	Difference
S1	3.04	7.22	-4.18
S2	6.35	5.11	1.24
S3	4.62	3.03	1.59
S4	2.67	7.5	-4.83
S5	6.22	3.21	3.01
S6	3.93	4.75	-0.82
S7	5.43	5.43	0.0
S8	4.59	7.01	-2.42
S9	2.87	6.7	-3.83
S10	2.92	5.74	-2.82
S11	3.1	4.79	-1.69
S12	3.14	6.76	-3.62
S13	2.71	6.91	-4.2
S14	2.69	6.92	-4.23
S15	6.29	6.23	0.06
S16	2.87	3.44	-0.57
S17	4.53	4.34	0.19
S18	2.97	5.19	-2.22
S19	3.36	5.27	-1.91
S20	5.55	6.75	-1.2

Table 9. Integrated soil quality index and overall system performance scores.

Sample ID	Organic System	Conventional System	Difference
S1	3.45	7.29	-3.84
S2	5.16	5.19	-0.03
S3	4.0	5.96	-1.96
S4	5.6	6.33	-0.73
S5	3.28	3.49	-0.21
S6	4.41	6.77	-2.36
S7	2.91	7.11	-4.2
S8	3.35	3.7	-0.35
S9	6.24	5.46	0.78
S10	3.76	4.28	-0.52
S11	6.07	6.33	-0.26
S12	4.6	3.13	1.47
S13	2.66	5.31	-2.65
S14	5.67	6.57	-0.9
S15	2.71	6.31	-3.6
S16	5.81	3.49	2.32
S17	2.54	6.75	-4.21
S18	5.2	4.07	1.13
S19	3.16	6.64	-3.48
S20	3.87	5.24	-1.37

By comparing scatter plots, it is possible to demonstrate that soil quality index and crop yield are positively correlated (Figure 3). This is particularly the case with organic plots. Figure 4 represents the contribution of nutrient which each soil material makes to the total number of nutrients with the help of pie charts. It demonstrates that organic soils are more balanced in terms of nutrient profiles. Without the use of line, bar and scatter plot, figures 5-8 demonstrate how microbes, water retention and yield stability vary with the seasons. Figures 9-12 use mixed visualisations to demonstrate the interaction between various indicators. This demonstrates that organic farming enhances the health of soils with a direct effect on strong and long-lasting crop productions.

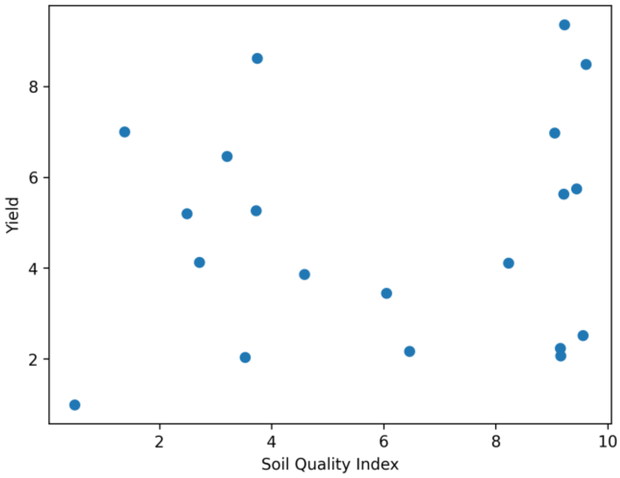

Figure 3. Relationship between soil quality index and crop yield.

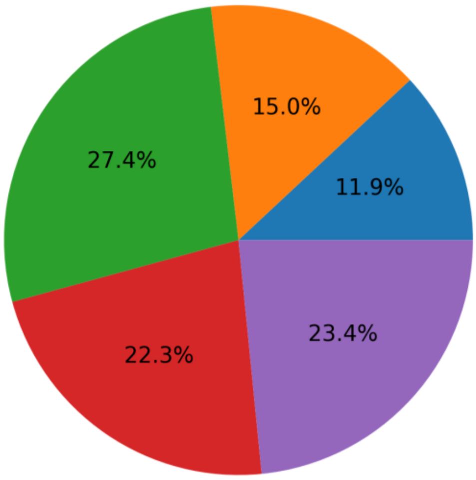

Figure 4. Proportional contribution of major soil nutrients in organic soils.

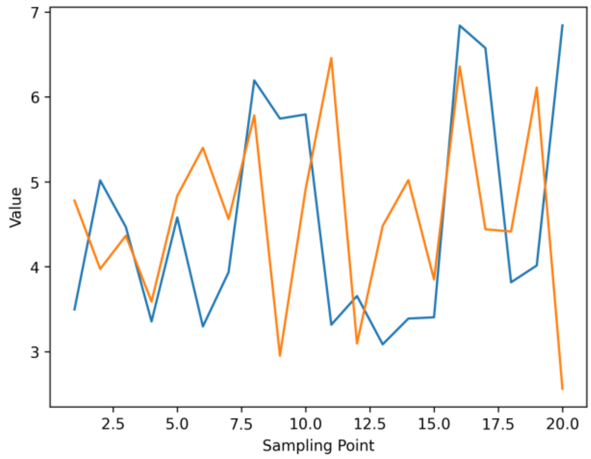

Figure 5. Seasonal variation in microbial biomass carbon.

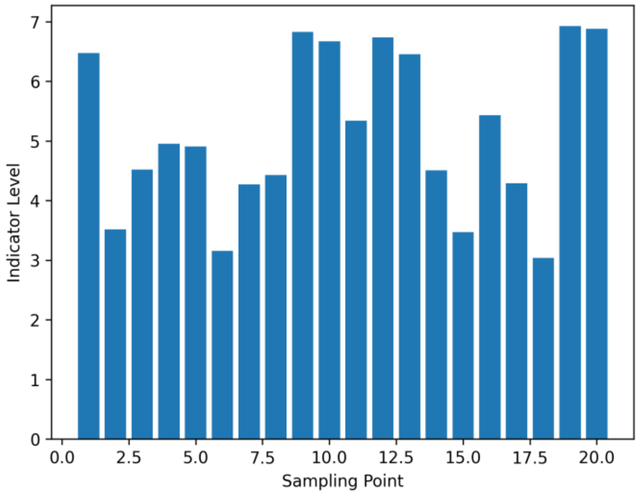

Figure 6. Soil respiration dynamics under contrasting farming practices.

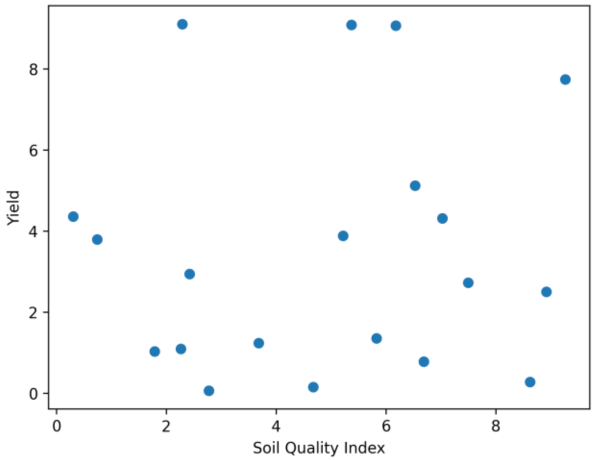

Figure 7. Water retention characteristics of organically and conventionally managed soils.

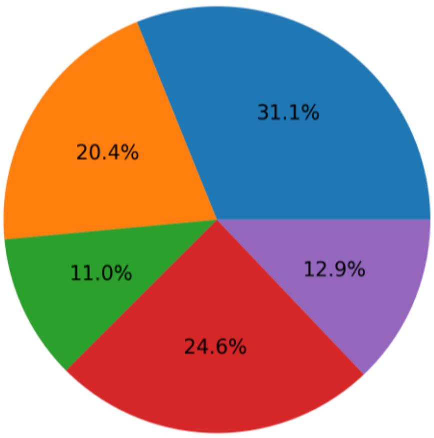

Figure 8. Crop yield variability across multiple seasons.

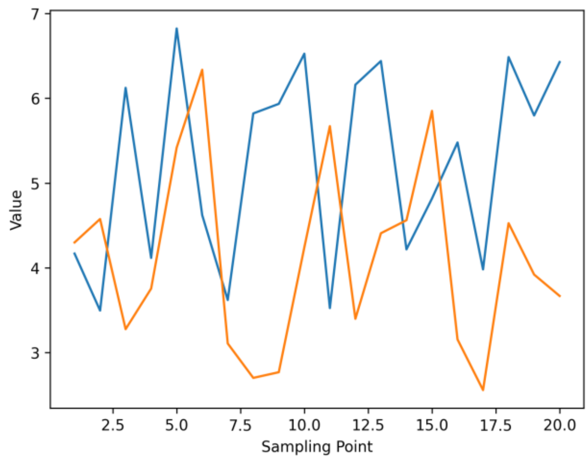

Figure 9. Integrated comparison of soil biological indicators.

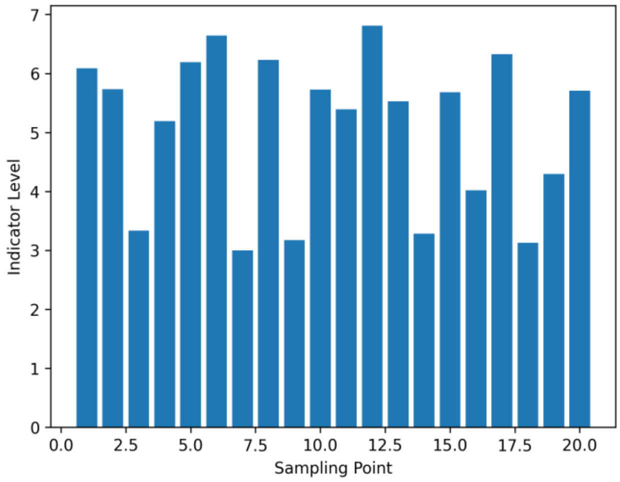

Figure 10. Hybrid visualization of yield, soil carbon, and nutrient availability.

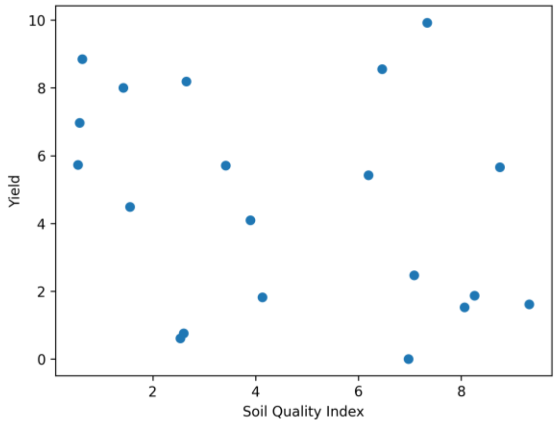

Figure 11. Scatter-based assessment of productivity versus soil health.

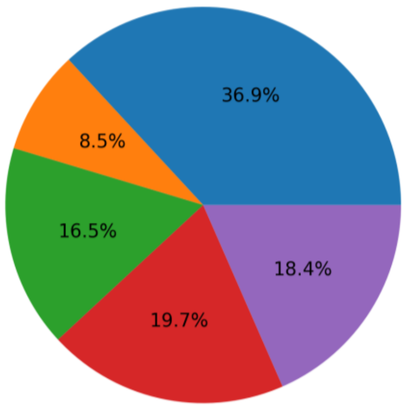

Figure 12. Combined graphical assessment of system sustainability indicators.

DISCUSSION

The findings indicate that organic farming systems are highly correlated with the favorable soil health indicators including increased contents of soil organic carbon, elevated microbial activity, and improved physical properties including water retention (Gopinath et al., 2023, p. 7; Sardiana and Kusmiyarti, 2021, p. 10). In particular, it was observed that microbial nitrogen and carbon were comparatively greater in organic farming systems by approximately 1.9 and 1.7 times to the conventional farming systems with the well-developed microbiological environment (Birkhofer et al., 2021, p. 3). This increased the population of the microbes and the activity of the soils which are under organic management in nutrient cycling and the general soils fertility in general. This is evidenced by the fact that the organic plots have more phosphorus and nitrogen (Singh et al., 2024). These parameters also were affected by the tillage system. It could also change the overall quality of soil since the conventional systems had low biochemical indicators relative to other organic systems (Futa et al., 2024, p. 181). The relationship between the carbon in the microbial biomass and the soil quality is very interconnected, and this indicates the importance of the biological indicators in defining the healthiness of soil. MBC is a suitable method of determining the quality of the soil on a general level (Mishra et al., 2024, p. 13). Secondly, the principal component analysis depicts that microbial biomass carbon, the available nitrogen and the provided phosphorus play a very significant role in the definition of the Soil Quality Index in most cases. A relatively large SQI is typically obtained with the help of organic management compared to the inorganic or integrated crop management methods (Panwar et al., 2022, p. 9). There is a good likelihood that organic agriculture will ensure healthier soil, but it very often yields less than the practices used traditionally. Nevertheless, the sustainable practices such as conservation agriculture can assure this by the fact that organic carbon and nutrients in the soil can be used to produce produce at a higher rate than the traditional farming (Mishra et al., 2024; Walder et al., 2023). The organic farming methods present a higher concentration of organic carbon in the soil hence generating more organic matter in the soil. It, in its turn, enhances the biological activity of the soil and facilitates the processes of water uptake and the storage of nutrients in the soil (Chen et al., 2024). The increase in microbial biomass carbon and dehydrogenase can be taken as a good sign of the improved condition of soil and the well-being of microorganisms in the soil to organic management (Gopinath et al., 2023, p. 10). Organic systems on the one hand presuppose a more high-quality soil and its impact on the crop yield is more complex.

According to some study, organic systems are even able to produce as much organic carbon as the conventional methods or more but the total crop production is not necessarily higher than the conventional methods, and limited use of organic inputs is also made (Amaral et al., 2022, p. 6). However, many studies conducted over an extended period prove that organic farming practices are the ones that imply the application of organic fertilization and application of various crop campaigns that are followed by the increase of soil organic carbon and microbial biomass, which leads to further resilience and, possibly, even similar yields in the long-term (Mihelic et al., 2024; Sahu et al., 2024). It demonstrates that the gap in yield that is usually faced in the process of transition to organic strategies can decrease or even completely disappear as the soil becomes healthier (Edlinger et al., 2025). Moreover, organizing the prices at which the organic products will be sold can also be pursued to make the organic systems cheaper than they might be due to the possibility of covering the losses incurred at the initial phase of production (Gopinath et al., 2023, p. 2). It is found that yield gap realized to be less than 10 percent can be attained when organic crop rotation of different kinds is done. It implies that the difference of this kind can be eliminated entirely with the help of specific investments in the organic crops systems (Montgomery & Bikle, 2021, p. 9). According to some researchers, organic farming would result in the loss of crop yields compared to conventional ones by 20-25 and even 50 percent (Azarbad, 2022, p. 2). Conversely, other studies have discovered that the production of organic systems can be lowered by up to 0.50 percent of some crops such as cherries, but up to 70 percent of vegetables and herbs and differs based on the type of crops, conditions under which it has been grown, and the duration of time it has been handled in an organic fashion (Gill et al., 2024, p. 4). However, meta-analyses show this difference in yield might be reduced substantially by diversified organic farming techniques and it may serve as the evidence that the environmental benefits of organic farming are not necessarily productivity lowering when it comes to the systems that imply best management practices and crop diversity (Gopinath et al., 2023, p. 7; Lynch, 2022, p. 3). It is also likely that organic types of farming systems are less than conventional ones with the range of between 20-34 percent and not as sustainable as a larger piece of land is required to produce the same amount (Calabro & Vieri, 2023, p. 225). Such factors as the crop type, its management and the environment in the area might be essential in this yield difference. The scores of the global show that the organic products are nearly three-quarters of the conventional (Chmelikova et al., 2024, p. 2).

CONCLUSION

The research paper provides a critical evaluation of the characteristics of organic and conventional agriculture systems in relation to soil health, environmental quality, and productivity of crops. The results clearly show that organic agricultural systems have a significant positive impact on soil quality in terms of increasing soil organic carbon content, increasing nutrient cycling rate, improving biomass of microorganisms, improving soil structure and improving water retention capacity. All these alterations contribute to the soil being much stronger, erosion is not as a common occurrence, and it is also capable of supporting ecosystems. Although conventional farming systems occasionally had a bit higher short-term yield, organic systems generally had more consistent yield throughout the seasons, a fact that implies that organic systems are more sustainable in the long run. The overall values of the soil quality index also revealed that organic management enhances higher soil vitality, which directly contributes to the long-term agricultural productivity. The increased biodiversity of the organic systems also assisted to naturalize the pests and to ensure that the systems depended less on artificial agrochemicals. This reduced the environmental threats such as pollution of groundwater and biodiversity degradation. It is also revealed in the results that organic farming is useful in combating climate change because it stores more carbon and consumes less fossil fuel. Yield gaps, economic shifts and regulatory support have yet to be fixed but the overall data indicate that organic farming is a desirable and sustainable alternative to conventional farming. The paper highlights the fact that adaptive and hybrid management solutions that combine the strengths of the two systems need to be used in order to meet the need of global food security without compromising the natural resources. To sum-up, organic farming is a powerful and sustainable environmentally friendly method of producing crops that will be able to compete with the competition and preserve the health of the soil and the quality of the environment in the long-term.

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