MedCrave
Step into the World of Research

Horticulture International Journal

Mini review

Open Access

CrossMark

A mini review on changes in soil attributes by management practices in organic vegetable production in Southeast Brazil

Abstract

The offer of healthier foods, the search for agricultural and economic sustainability and the appreciation of the role of farmers are the notorious foundations of organic agriculture in society. These principles are reflected in the insertion of specific agricultural practices adopted in the soil, which are based on the maintenance of soil fertility and long-term biological activity. Therefore, management practices that favor and contemplate these principles are of great interest to researchers and organic farmers. From this, the objective of this review was to understand the main effects of different management practices on organic vegetable production. Preliminary studies show that there is a great incentive for the establishment of this management system in organic production.

Keywords: management system, vegetables, organic farming.

Volume 5 Issue 1 - 2021

Camilla Santos Reis de Andrade da Silva,[1] Carolina Santos Reis de Andrade da Silva,[2] Ednaldo da Silva Araújo,[3] Érika Flávia Machado Pinheiro,[4] Maura Santos Reis de Andrade da Silva[5]

[1]Soils Department, Federal Rural University of Rio de Janeiro, Brazil
[2]Geochemistry Department, Federal Fluminense University, Brazil
[3]Brazilian Agricultural Research Corporation, Embrapa Agrobiologia, Brasil
[4]Soils Department, Federal Rural University of Rio de Janeiro, Brazil
[5]Crops Production Department, São Paulo State University, Brazil

Correspondence: Camilla Santos Reis de Andrade da Silva, UFRRJ, Seropédica, Rio de Janeiro, Brazil, Email camilla.sras@gmail.com

Received: December 15, 2020 | **Published:** January 07, 2021

Introduction

The consumption of vegetable in Brazil is still incipient when compared to developed countries in Europe and North America. However, the market is growing in the country due to incentives for healthier eating habits. This production sector is present in most regions of the country, especially in the South and Southeast. Vegetable cultivation is the second productive system that most corroborates with soil degradation, mainly due to the intensive use of the soil by mechanization and the use of agricultural inputs.[1]

Specifically, in organic agriculture, the plow, harrows and rotary hoe are traditionally utilized to prepare the soil before sowing or planting, to control spontaneous plants, to bury intermediate crops and to incorporate organic fertilizers and additives. On the other hand, the soil preparation interferes in the soil structure through the action of these agricultural implements, causing the rupture of the macroaggregates, and this consequently reflects in the loss of organic matter, in the decrease of water infiltration and favors soil erosion.

Few studies in Brazil have evaluated the sustainability and performance of those different management strategies on soil properties. For this reason, the objective of this review is to present the main effects of different management practices on organic vegetable production on soil properties, aiming to expand the importance and knowledge of this theme for the scientific community.

Material and methods

The literature review was based mainly on publications in Brazil, in order to identify the effects of different soil management practices on organic vegetable production. In this sense, this paper compiled several scientific articles based on the subject in question, and addressed the following keywords: organic farming, vegetables, management systems, no-till, conventional tillage.

Effect of management practices on soil properties

The studies by[2–5] carried out in the Integrated System of Agroecological Production ("Fazendinha Agroecológica Km 47"), in the Municipality of Seropédica (RJ), evaluate the following types of organic management: planting of fig (with reduced preparation), direct planting of corn / eggplants, the cultivation of corn / beans with conventional tillage and the agroforestry system. The following attributes were determined for each organic crop: soil density, weighted mean diameter (WMD) and geometric mean diameter(GMD) of aggregates, pH, aluminum, calcium, magnesium, potassium, potential acidity, phosphorus, total organic carbon, fractions of organic matter (particulate organic carbon and organic carbon associated with minerals), fractions of humic substances, carbon stock in the soil and carbon management index. It was observed that in the area with no-tillage (corn intercropped with eggplant) higher values of WMD, GMD, humic acid, particulate organic carbon and better carbon management index was found. In the area with conventional tillage, lower values of these attributes were observed compared to no-tillage. The authors also pointed out that the area with direct planting of eggplant showed greater sustainability than the others, based on the best carbon management index. In fig production, higher values of total organic carbon, humine fraction, carbon stock, organic carbon associated with minerals, nitrogen and better fertility levels were observed.

Still in this same place, at "Fazendinha Agroecológica km 47", Rossi et al.[6] evaluated the formation of soil aggregates and chemical attributes in different agricultural areas, namely: agroforestry system, with 10 years of implementation; coffee in full sun (15 years); shaded coffee (15 years old); alleys with phlegmia (10 years); and no-tillage of corn and eggplant (6 years). It was noticed that the management systems had a homogeneous effect on the types of aggregates (physiogenic, intermediary and biogenic). The authors found that the managements with a longer implantation time exhibited higher levels of carbon in the soil, calcium, magnesium and with higher values of weighted average diameter and geometric mean diameter.

Still in these previous areas, Moura et al.[7] Pinto et al.[8] evaluated, respectively, the fractions of phosphors in biogenic and physiogenic aggregates, and the quantification of C-CO2. The results for all areas of organic production showed adequate levels of phosphorus, allowing self-sufficiency in relation to phosphate nutrition. The authors also highlighted the advantages of the management practices adopted in organic agriculture, since it allows less demand for external inputs. In the second study, in these same management systems, it was evidenced by Pinto et al.[8] that no-tillage showed higher C-CO2 emission values in biogenic aggregates in relation to the other areas, the authors attributed this result to the lower C / N ratio of the crops (corn and eggplant) implanted in this area, by organic fertilization (cattle manure and chicken litter), and at the lowest temp.

The work carried out by Favarato et al.[9] in Domingos Martins / ES, exposed that the system of direct planting of green corn promoted a reduction in the levels of organic carbon, but increased the values of pH, phosphorus, potassium and calcium in the soil. Despite being punctual results, the work showed the efficiency of the straw (vegetation cover) in promoting significant contributions of chemical contents in the soil.

Ramos et al.[10] and Valarini et al.[11] evaluated the soil quality in areas with organic vegetable production and compared it with forest areas and areas under conventional management. The first survey was conducted in Colombo / PR, and evaluated soil porosity, hydraulic conductivity, aggregate stability and soil density. In this study, the organic production system provided better soil physical conditions compared to the conventional system, attributed to the higher values of hydraulic conductivity and soil aggregation. The better performance of the organic system was probably due to the management with animal traction and the use of several winter species. The conventional system required chanized management and only a kind of winter. In the second study, performed in São Paulo, physical, chemical and biological attributes of the soil were evaluated. It was verified that the management led to soil degradation, having seen a reduction in the contents of organic matter, microbial biomass and in the stability of aggregates. The degradation was due to the intense revolving of the soil and the removal of the vegetation cover in these soils, the evaluated areas presented values inferior to those of the forest.

These surveys are important, as they motivate farmers to adopt organic management on their properties. Such effects reveal the advantages of organic soil management in maintaining or increasing soil fertility in areas under organic production and improving the productivity of commercial crops.

Final considerations

In general, studies have shown common effects on improving fertility and increasing organic matter through the use of cover crops. The reduced tillage and no-tillage provided higher levels of organic carbon and soil aggregation, compared to conventional tillage. Therefore, these surveys demonstrate the benefits of the management practices adopted (no-tillage and minimum cultivation) in organic management for the sustainability of the agro-ecosystem and for soil quality, despite being punctual results. Additionally, it is possible to verify the lack of studies related to the evaluation of soil quality in organic systems.

Acknowledgments

The authors would like to thank the National Council for Scientific and Technological Development - CNPq for the financial support for this project.

Conflicts of interest

Authors declare no conflict of interest exists.

References

1. Branco BFR, Hirata ACS, Purqueiro LFV, et al. Manejo conservacionista do solo no cultivo de olerícolas. In: Bertol I, De Maria IC, Souza LS,editores. Manejo e conservação do solo. *Viçosa: Sociedade Brasileira de Ciência do so*lo. 2018 ;1119–1153.
2. Loss A, Pereira MG, Schultz N, et al. Frações orgânicas e índice de manejo de carbono do solo em diferentes sistemas de produção orgânica. *Idesia*. 2011;29(2):11–19.
3. Loss A, Pereira MG, Schultz N, et al. Atributos químicos e físicos de um Argissolo Vermelho-Amarelo em sistema integrado de produção agroecológica. *Pesq agropec bras*. 2009;44(1):68–75.
4. Loss A, Pereira MG, Schultz N, et al. Distribuição dos agregados e carbono orgânico influenciados por manejos agroecológicos. *Acta Sci Agron*. 2009b;31(3):523–528.
5. Loss A. Carbono, matéria orgânica leve e frações oxidáveis do carbono orgânico sob diferentes sistemas de produção orgânica. *Comunicata Scientiae*. 2010;8(1):57–64.
6. Rossi CQ, Pereira MG, Moura OVT de, et al. Vias de formação, estabilidade e características químicas de agregados em solos sob sistemas de manejo agroecológico. *Pesq agropec bras*. 2016;51(9):1677–1685.
7. Moura OVT de, Rossi CQ, Pereira MG, et al. Fósforo em agregados biogênicos e fisiogênicos sob diferentes sistemas de manejo agroecológico. *Agrarian*. 2019;12(46):66–78.
8. Pinto LASR, Mendonça OVT, Rossi CQ, et al. Evolution and accumulation of C-CO2 in biogenic and physiogenic aggregates of different agroecological management systems. *Acta Agron*. 2018;67(4):494–500.
9. Favarato LF, de Souza JL, Galvão JCC, de CM, et al. Atributos químicos do solo com diferentes plantas de cobertura em sistema de plantio direto orgânico. *RevBras Agropec Sustentável*. 2015;5(2):19–28.
10. Ramos MR, Favaretto N, Uhlmann A, et al. Produção de hortaliças no sistema orgânico: efeito nos atributos físicos do solo. *Rev CiencAgrar*. 2015;58(1):45–51.
11. Valarini PJ, Oliveira FR, Schilickmann S de F, et al. Qualidade do solo em sistemas de produção de hortaliças orgânico e convencional. *Hortic Bras*. 2011;29(4):485–491.