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Eighteen years of research on soil management systems in rainfed olive groves

M Angelo Rodrigues and Margarida Arrobas
Polytechnic Institute of Bragança, Portugal

Despite the increased acreage of high-density irrigated orchards, traditional rainfed olive groves maintain huge social importance. While in irrigated orchards cover cropping is generalized, in the rainfed groves the ground continues to be tilled or maintained barely by using herbicides. Cover cropping is important as is an effective mean of reducing soil erosion. However, the covers consume water which can severely reduce olive yields. Over the last 18 years, experimental work has been done in searching for a solution for these orchards. This work summarizes the results obtained in several field trials, which included several soil management treatments, such as conventional tillage, bare soil by using residual or post-emergence herbicides, natural vegetation mowed or grazed, legumes of erect habit grown as green manures and self-reseeding annual pasture legumes. The results indicate that withdrawing tillage and allowing the development of the root system significantly increases olive yield. Cover crops of natural vegetation control soil erosion and improve several soil fertility parameters but significantly reduce olive yield through excessive competition for water. Green manures are difficult to manage since they require be sowing and incorporating into the soil by tillage. If the green manures are managed as mulching it causes significant nitrogen losses to the atmosphere. In these orchards, the theoretical model that aggregate the best results is the growing of very early-maturing self-reseeding annual legumes. These plants provide enough protection of the soil, fix nitrogen in rates able to maintain the trees at nutrition levels higher than the application of 60 kg N ha⁻¹ year⁻¹ and ensures high olive yields due to the little competition for water. These covers proved to be the only way to make profitable organic farming, an interesting alternative for these low input agricultural systems.



Recent Publications:

1. Arrobas M, Lopes H and Rodrigues M A (2017) Urban agriculture in Bragança, Northeast Portugal: assessing the nutrient dynamic in the soil and plants, and their contamination with trace metals. *Biological Agriculture and Horticulture* 33(1):1-13.
2. Rodrigues M A, Afonso S, Ferreira I Q and Arrobas M (2017) Response of stevia to nitrogen fertilization and harvesting regime in Northeastern Portugal. *Archives of Agronomy and Soil Science* 63(5):626–637.
3. Rodrigues M A, Dimande P, Pereira E, Ferreira I Q, Freitas S, Correia C M, Moutinho-Pereira J and Arrobas M (2015) Early-maturing annual legumes: an option for cover cropping in rainfed olive orchards. *Nutrient Cycling in Agroecosystems* 103:153–166.
4. Rodrigues M A, Ferreira I Q, Freitas S, Pires J and Arrobas M (2015) Self-reseeding annual legumes for cover cropping in rainfed managed olive orchards. *Spanish Journal of Agricultural Research* 13(2): e0302.

5. Arrobas M, Ferreira I Q, Freitas S, Verdial J and Rodrigues M A (2014) Guidelines for fertilizer use in vineyards based on nutrient content of grapevine parts. *Scientia Horticulturae* 172:191-198.

Biography

M Angelo Rodrigues has obtained his PhD degree in Edaphic and Environmental Sciences at the University of Tras-os-Montes and Alto Douro, Portugal in 2000. He has coordinated and/or participated in two dozen National and International research projects. He has published 130 scientific papers (31 in ISI/JCR journals), book chapters and technical reports. He has been Deputy Director of the School of Agriculture of IPB and President of the scientific committee of the Master's program of Agroecology at the same institution. He was Vice-Coordinator of the Mountain Research Centre and Vice-Delegate of the Order of Engineers of the district of Bragança, Portugal.

angelor@ipb.pt

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