No-tillage and cover crop practices for the agroecological transition of rainfed Tunisian olive groves

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Introduction

In Tunisia, climate change, severe soil degradation and low soil fertility, exacerbated by inappropriate agronomic systems, have led to unbalanced, less resilient and increasingly unsustainable farming systems. This has had serious consequences in socio-economic and environmental terms. In order to address these problems and to improve the agronomic performance of olive groves, we tested **the effect of different agricultural soil management practices (tillage, no-tillage and cover crops) on soil properties, olive tree nutrient dynamics and olive production.**

Materials

- Olive trees (Olea europaea L. cv Chetoui and Chemlali) were grown at two experimental sites (Toukaber, Beja Governorate, and Jammel, Monastir Governorate, Tunisia) during the cropping seasons of 2022 and 2023 ('on' and 'off' years) The sites have been selected according to the rainfall gradient (300 mm to 500 mm)
- Fenugreek (Trigonella foenum-graecum) and faba beans (Vicia faba) were used as intercrops. The sowing was carried out in January and the turning of the soil in May for each year, with a sowing density of 90 kg/ha for the faba beans and 34 kg/ha for the fenugreek.

Methodology

The study was conducted at two sites in Tunisia: Toukaber (Beja) and Jammel (Monastir), using a Randomized Block Design.

At the two sites, 4 treatments were applied

- T1: Farmer practices (tillage)
- T2: Fava bean intercropping,
- T3: Fenugreek intercropping,
- T4: No tillage (natural cover crop)

T1

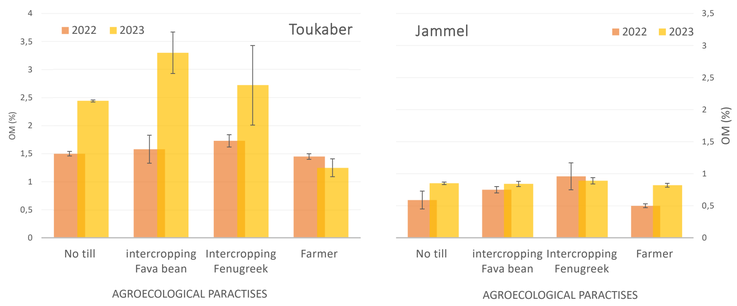
T2

T3

T4

Results

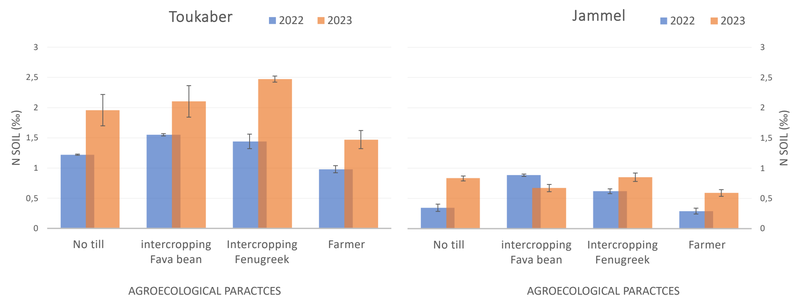
Agroecological practices impact on soil organic matter



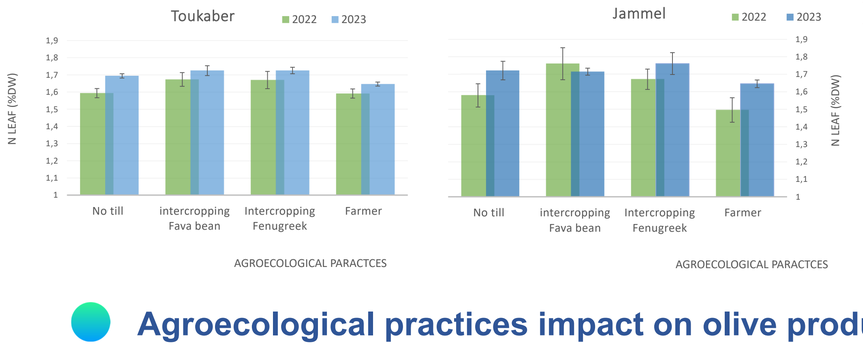
- Intercropping (natural or seeded) significantly increased soil organic matter by **42%** compared to the farmer, especially at the Toukaber site after two years.

Agroecological practices impact on soil nitrogen

- After two years, soil nitrogen increased by **32%** in Toukaber and **24%** in Jammel with intercropping and no-tillage practices.



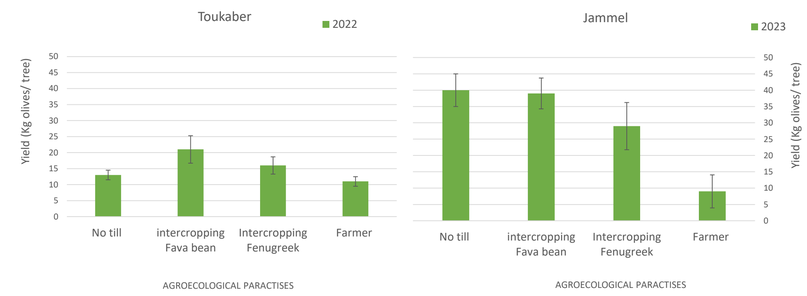
Agroecological practices impact on leaf nitrogen



- Agroecological practices (cover crops and no-till) increased Leaf N% by **5%** over two years at both sites.

Agroecological practices impact on olive production

- Agroecological practices significantly increased production per tree by **75%** in Jammel, and intercropping fava bean and fenugreek increased it by **40%** in Toukaber.



Conclusion

Climate-resilient agriculture requires the use of specific agroecological practices. The specificity of the area and the rainfall gradient determine the choice of practices:

- In the Jammel region, no-tillage has improved soil fertility and increased production. In this area, no-tillage is recommended at the expense of intercropping due to water scarcity.
- In Toukaber, intercropping with fava beans and fenugreek improves soil health and fertility, resulting in better olive tree growth and increased olive yields. Due to the clay nature of the soil, no tillage was not recommended in this zone.

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