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Crop Diversification for Asparagus in the Pannonian Pedoclimatic Region: Opportunities and Constraints

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Abstract

The H2020 project of the European Union 'Diverfarming' aims at introducing various crop diversification technologies and low-input management practices to cropping systems in all pedoclimatic regions of Europe and removing the barriers which limit their adoption. Among the case studies CS10 is located in a sand region of Hungary and represents the Pannonian region. In the experiment asparagus is intercropped with field pea and oats. The first results of the experiment show improved ecosystem services in respect to soil fertility (available nutrients), soil structure and reduction of wind erosion.

Keywords: Crop diversification; Humic Arenosol; Asparagus officinalis; Pisum sativum; Avena sativa; nutrients; Ecosystem services

Introduction

Although profitable from an economic aspect, crop monoculture is damaging to the environment. The agricultural policy of the European Union encourages a turn towards diversified agriculture. Where it is possible, monocropping should be replaced by crop diversification, including crop rotation, intercropping and multiple cropping. As formulated in the Diverfarming project diversified cropping systems can increase the delivery of ecosystem services (soil fertility, prevention of soil and water contamination, water availability, reduced greenhouse gas [GHG] emissions, carbon sequestration, erosion prevention, above and belowground biodiversity and pest and disease control). One of the perennial crops selected for crop diversification experimentation is asparagus (*Asparagus officinalis*), an increasingly popular vegetable with high nutritional value (minerals, vitamins A, B and C) [1]. It is produced in 1400ha in Hungary with conventional management (ridging, foil cover, green manuring with crop residue and mineral fertilizer and pesticide application). Organic farming is not feasible and there is no need for it either [2] since it is unlikely that large amounts of pesticide residues accumulate in the spears [3].

Material and Methods

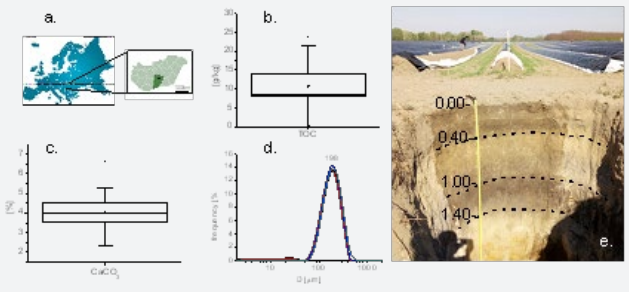

Figure 1: Asparagus Field with Soil Profile and Topsoil Properties.

a. location.
b. total organic carbon.
c. carbonate content.
d. particle size distribution.
e. soil profile (0-40cm: cultivated, 0.4-1.00 arenic, 1.00-1.40

The Diverfarming experimental site CS10 (coordinates: 46°44'52.6"N; 19°34'25.7"E) lies in the Kiskunság region, a

Pleistocene alluvial fan of the Danube covered by blown sand with Humic Arenosol, which has a uniform particle size distribution (median at 198µm) (Figure 1) and is poor in nutrients (N: 0.3g kg^{-1}, $P_{available}$: 110mg kg^{-1}). Climate is continental, close to semiarid (mean annual temperature, 1980-2010: 10.7°C (Hungarian Meteorological Survey, OMSz); average annual precipitation: ca 550mm) with frequent extremes. The1.8-m-wide interrow spaces between the asparagus ridges allow intercropping. As intercrops two fodder crops have been chosen for the experiment: a leguminous plant, pea, with high P and K contents and weather-tolerant and also nutrient-rich oats (Figure 2). Both are primarily meant to be used for green manuring and partially as catch crop.

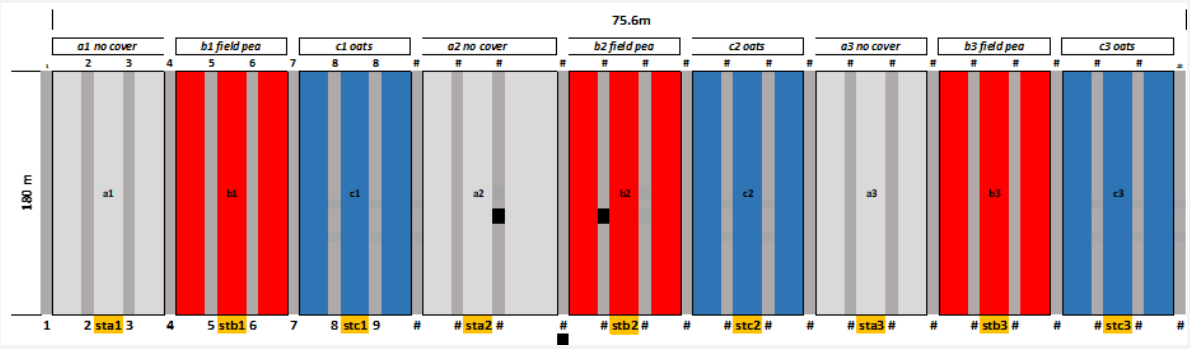

Figure 2: Experimental Plot Design.

Results and Discussion

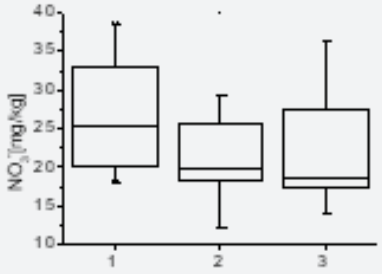

Figure 3a: Nitrate Content, 1, control; 2, field pea, 3, oats

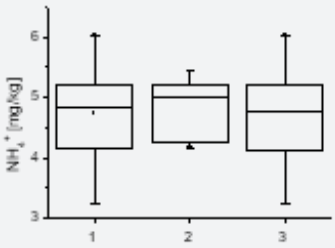

Figure 3b: Nitrate Content, 1, control; 2, field pea, 3, oats

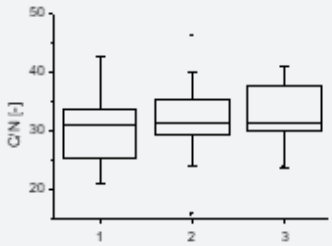

Figure 3c: 1, control; 2, field pea, 3, oats C/N ratio Oats.

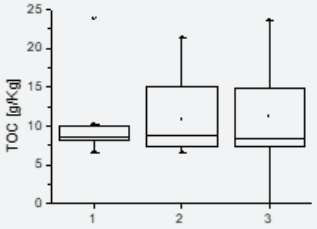

Figure 4a: Total Organic Carbon Content (TOC) 1, control; 2, field pea, 3, oats

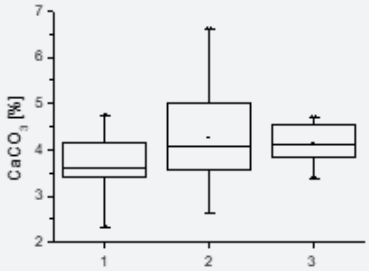

Figure 4b: 1, control; 2, field pea, 3, oats Carbonate Content 1, control; 2, field pea, 3, oats.

In the first year drought conditions prevailed and the intercrops poorly developed. After the first year of the experiment N-levels remained low in all the three treatments. The ammonium content of the soil shows more variation than nitrate between the treatments b and c (Figure 3a & 3b). C/N ratios show the highest range for the treatment with oats (Figure 3c). However, it remains to be seen whether it is really due to the impact of intercropping. The range of total organic carbon content (TOC) is much wider in the treatments with intercrops than under conventional

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management (Figure 4a). A remarkable rise in carbonate content is also observable for the plots with intercropping (Figure 4b). Better results are expected for the second year, which was warmer and more humid and thus produced higher yields. The data are now being processed.

Conclusion

Diversification is beneficial for providing soil cover and protection against desiccation and wind erosion. It also promotes soil aggregation through increasing carbon content and preventing the leaching of nutrients. However, it also has some drawbacks. Among others, intercropping raises the problems of pesticide application and crop harvesting. At asparagus harvest time no pesticide can be applied to the intercrops. The harvesting of intercrops requires specialized machinery. Further problems with asparagus production include the lack of trained labour force which does not allow expansion to meet market demands and the waste of spears (up to 30%) of good quality but aesthetically deficient and, therefore, cannot be marketed.

Field-level diversification can ultimately contribute to the design of a diverse landscape pattern with higher biodiversity too.

Acknowledgement

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References

1. Van Wyk B-E (2019) Asparagus in: Food Plants of the World: Identification, Culinary Uses and Nutritional Value. CABI Wallingford UK.
2. Okamoto Y, Shibamoto T (2004) Degradation of malathion in aquaeous extracts of asparagus (Asparagus officinalis). Journal of Agricultural Food Chemistry 52(19): 5919-5923.
3. EWG (2019) Shopper's Guide to Pesticides in Produce. Environmental Working Group Washington DC.

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