Maize-soybean strip intercropping in organic farming, in Austria

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Introduction

Intercropping is the cultivation of multiple crop species in the same field at the same time and has multiple ecological advantages, e.g related to nutrient capture and disease control (Weih et al., 2022).

Nitrogen (N) plays a vital role in maize growth, significantly influencing crop yield, but intercropping with a legume can mitigate the requirement for N input. There is little experience in Europe with intercropping maize with legumes (but see Wang et al., 2023).

Aim of Study

This study aims to examine maize yield in an intercropping system with soybean, comparing it to monocropping within an organic farming framework with low or no fertilizer input.

Materials and Methods

The field trial was conducted on organically managed fields at the University of Natural Resources and Life Sciences, Vienna.

Location: Raasdorf, about 5 km east of Vienna in the Marchfeld region.

Climate characteristics of Marchfeld:

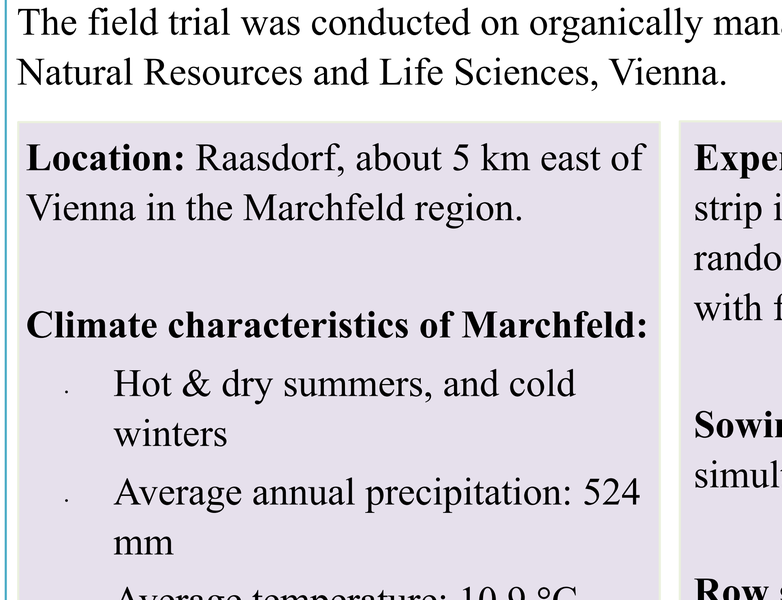
- Hot & dry summers, and cold winters
- Average annual precipitation: 524 mm
- Average temperature: 10.9 °C (2000-2020)

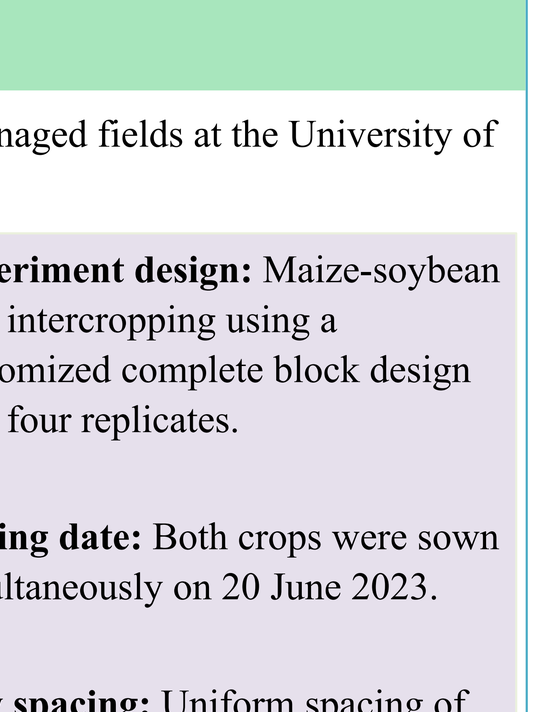
Experiment design: Maize-soybean strip intercropping using a randomized complete block design with four replicates.

Sowing date: Both crops were sown simultaneously on 20 June 2023.

Row spacing: Uniform spacing of 50 cm.

The experimental treatments compared two cropping systems: monocrops of maize or soybean, and strip intercropping with a pattern of three rows of maize and three rows of soybean (a total of 12 rows, each strip measuring 1.5 meters), crossed with two fertilization levels: fertilized and unfertilized.





The organic fertilizer used in the experiment was "Sedumin hair meal pellets N 14%" at a rate of 190 kg N/ha in the fertilized treatment. Maize plants were harvested in October 2023 and seed yield and relative yield were calculated after drying.

Results and Discussion

Maize yield was significantly higher in the monocrop than in the intercrop with soybean in both the fertilized and unfertilized treatments ($P<0.05$), and in both cases, the maize yield in intercropping was 71% of the yield in the sole crop (Table 1). Observed yields were lower at zero fertilizer input than with fertilization, but the fertilization effect was not significant in an analysis of variance with cropping system and fertilization as factors ($P>0.05$).

Table 1: Impact of fertilization and intercropping with soybean on the yield of maize in organic farming.

Fertilization	Cropping system	Yield (t/ha)
Fertilized	Sole maize	11.56 ± 1.94
	Intercropped maize	7.10 ± 0.45
	Relative yield	0.71 ± 0.19
Unfertilized	Sole maize	9.74 ± 1.20
	Intercropped maize	6.53 ± 0.64
	Relative yield	0.71 ± 0.12

Thus, fertilization did not significantly increase yield under the conditions of the study. The relative maize yield in intercropping was substantially higher (71%) than would have been expected on the basis of its proportion in the mixture (50%) indicating that intercropping favoured the growth of maize plants.

Conclusions

The results highlight the potential of intercropping within organic farming as effective models for reducing input requirements.

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References