

Performance of Steel Slag and Compost on Grain Yield, Irrigation Water Use Efficiency, and Soil Fertility of Durum Wheat (*Triticum durum* Desf.) Under Sustained Deficit Irrigation in Arid Conditions of Morocco

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INTRODUCTION AND AIM

Water scarcity and rising aridity threaten crop production globally and in Morocco, where water stress is expected to exceed 80% by 2040 and drought can reduce yields by 20-50%. This study explores a sustainable, cost-effective approach using compost and steel slag as soil amendments to improve durum wheat performance under full and sustained deficit irrigation (SDI) conditions.

MATERIALS AND METHODS

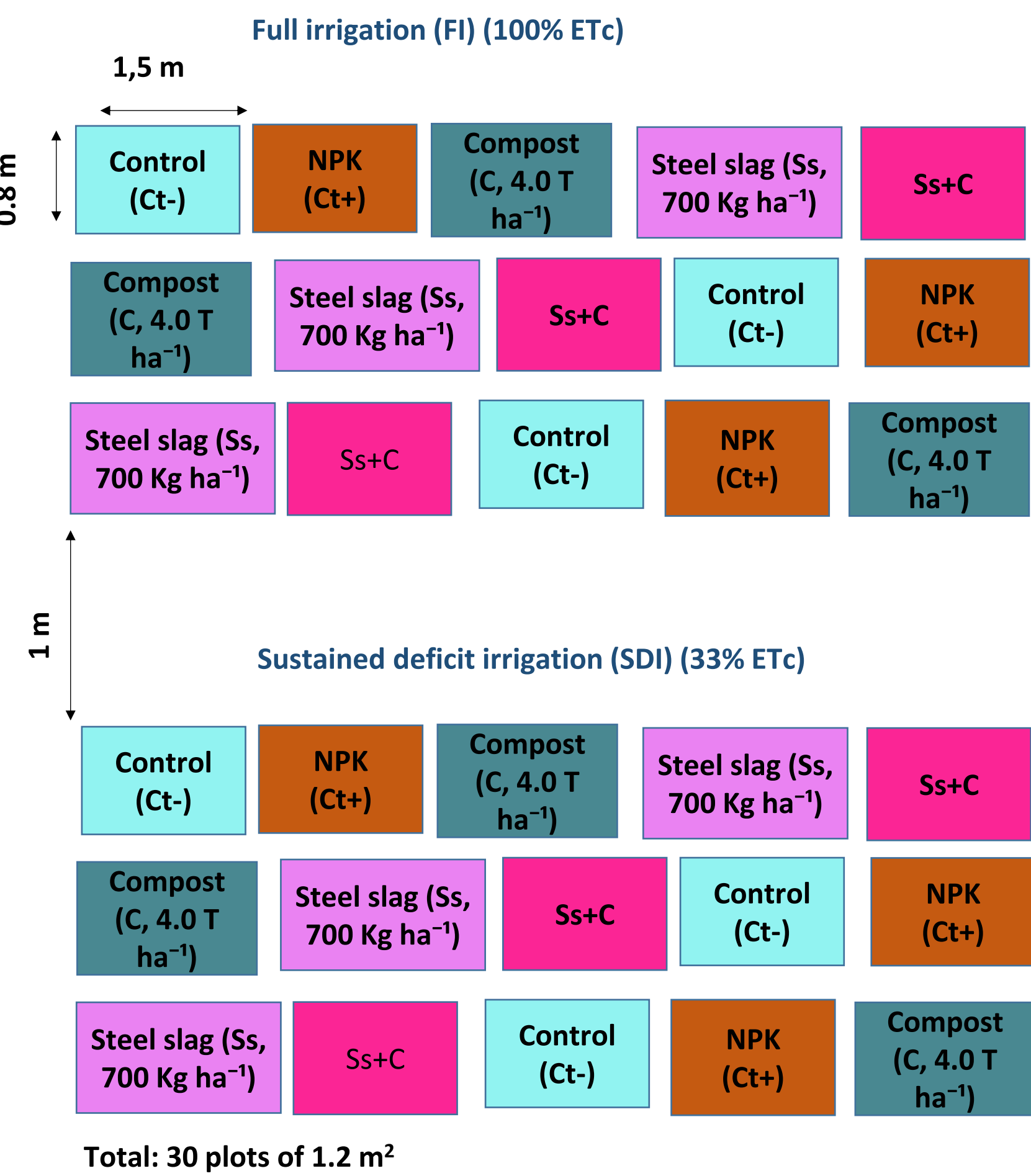
Experimental site : A farm in Loudaya province, Marrakesh, Morocco (31°34'46.2"N, 8°16'13.1"W)

Climate : Arid (45.40 mm in the 1st season and 43.79 mm in the 2nd season)

Cultivar : Durum Wheat (*Triticum durum* Desf.)

Period : Two growing seasons 2023 and 2024 (S1 and S2)

Experimental design : Randomized complete block design with three replicates



RESULTS AND DISCUSSION

1. Impact of deficit irrigation and the organo-mineral amendment on productivity and water use efficiency of Durum Wheat

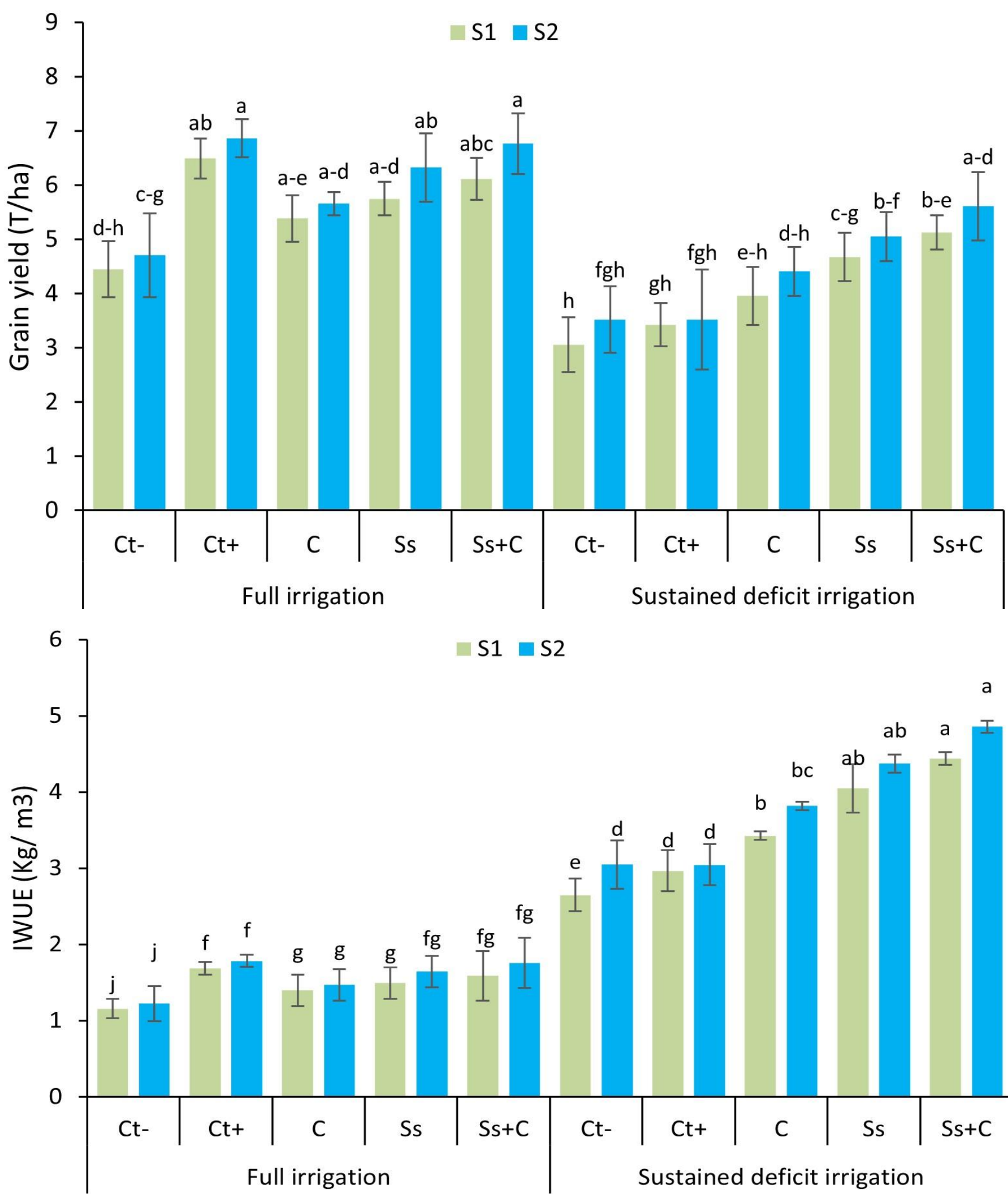


Figure1. Effect of different amendment practices on yield (a) and irrigation water use efficiency (b) of durum wheat (*Triticum durum* L. var. Carioca) cultivar under Full irrigation and deficit irrigation over two growing seasons (S1 and S2).

- Under deficit irrigation, Ss+C considerably improved yield by **68%** in S1 and **59%** in S2.
- IWUE also improved under SDI, which reached **4.44 kg/m³** (S1) and **4.85 kg/m³** (S2) with Ss+C compared to **2.65** and **3.05 kg/m³** in the stressed controls.

2. Impact of the different fertilization strategies on soil micronutrients

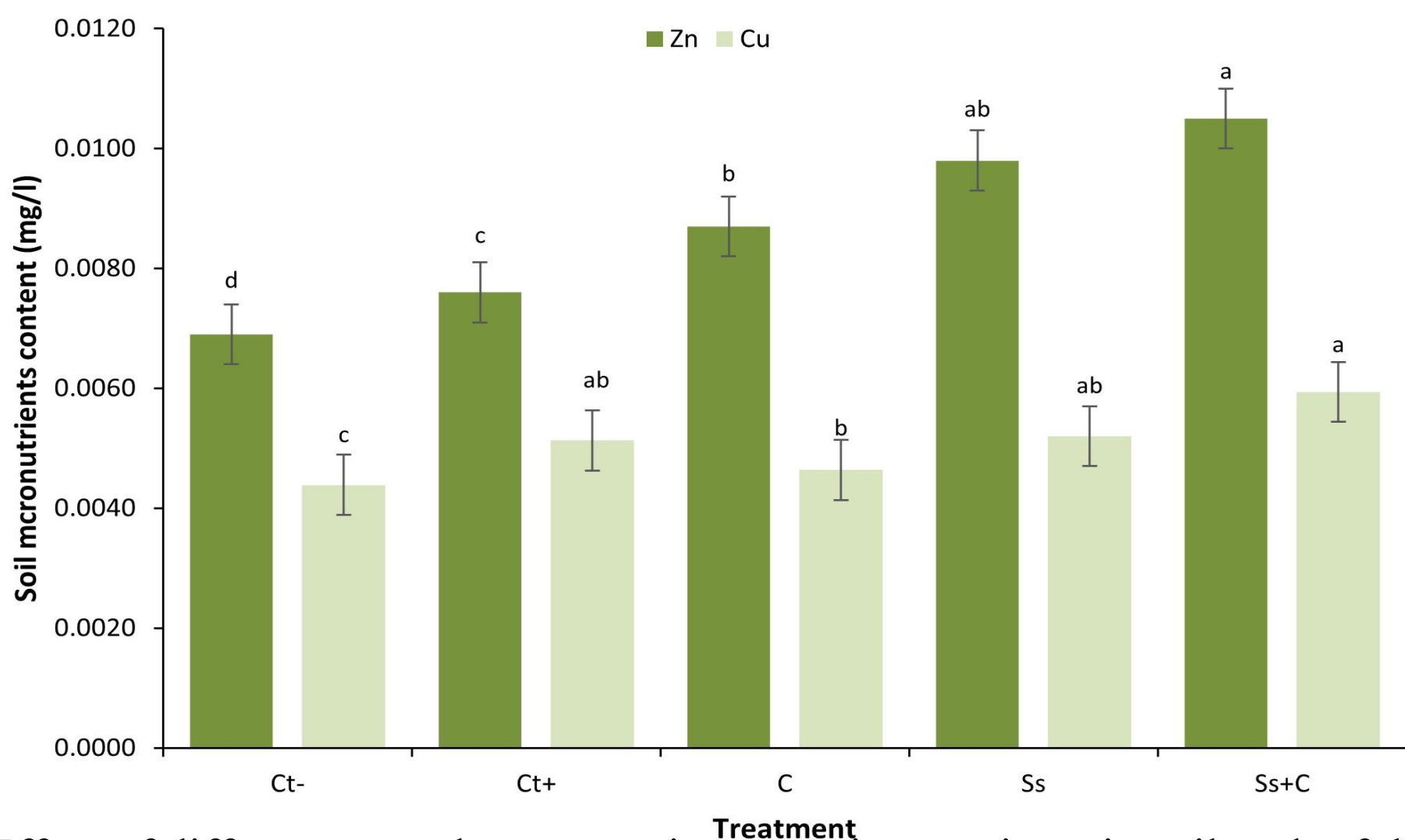


Figure2. Effect of different amendment practices on micronutrients in soil under full irrigation.

- After harvest, soil micronutrients improved, with Cu and Zn contents increasing by **35%** and **52%**, respectively, under full irrigation with Ss+C.

CONCLUSION AND PERSPECTIVES

Our findings show that under dry, water-limited conditions, the combined use of compost and steel slag serves as an effective organo-mineral strategy to alleviate water stress, sustain durum wheat yield, and improve soil fertility.