



Introduction

- Sub-Saharan Africa is at a great food security risk because by 2050 its population will increase 2.5-fold (van Ittersum et al., 2016).
- Agricultural production system in the region is subject to frequent yield losses due to erratic rainfall.
- It is necessary to introduce irrigation. A sound application of full and limited irrigation requires a thorough understanding of the crop parameters and yield response to water.

Research Objectives

To investigate the effect of full and limited irrigation on maize (*Zea mays* L.) plant above-ground biomass, leaf area index, canopy cover, plant height, and grain yield in northern Togo.

Materials and Methods

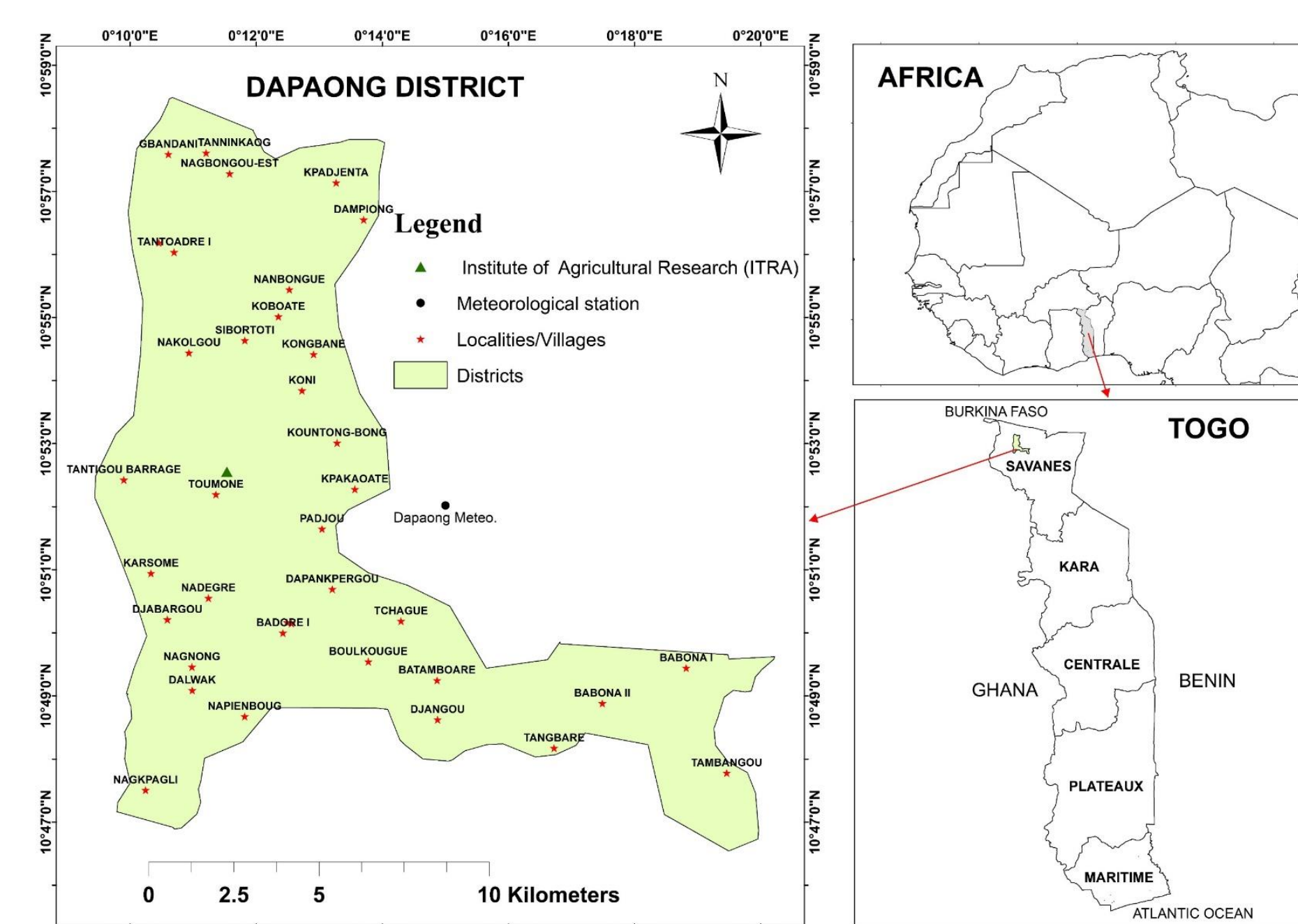


Fig. 1. Study area

Three irrigation treatments:

- FI (Full Irrigation);
- 80% FI (Optimal controlled deficit irrigation);
- 60% FI (Controlled deficit irrigation).

Randomised complete block design (RCBD) with three replications.

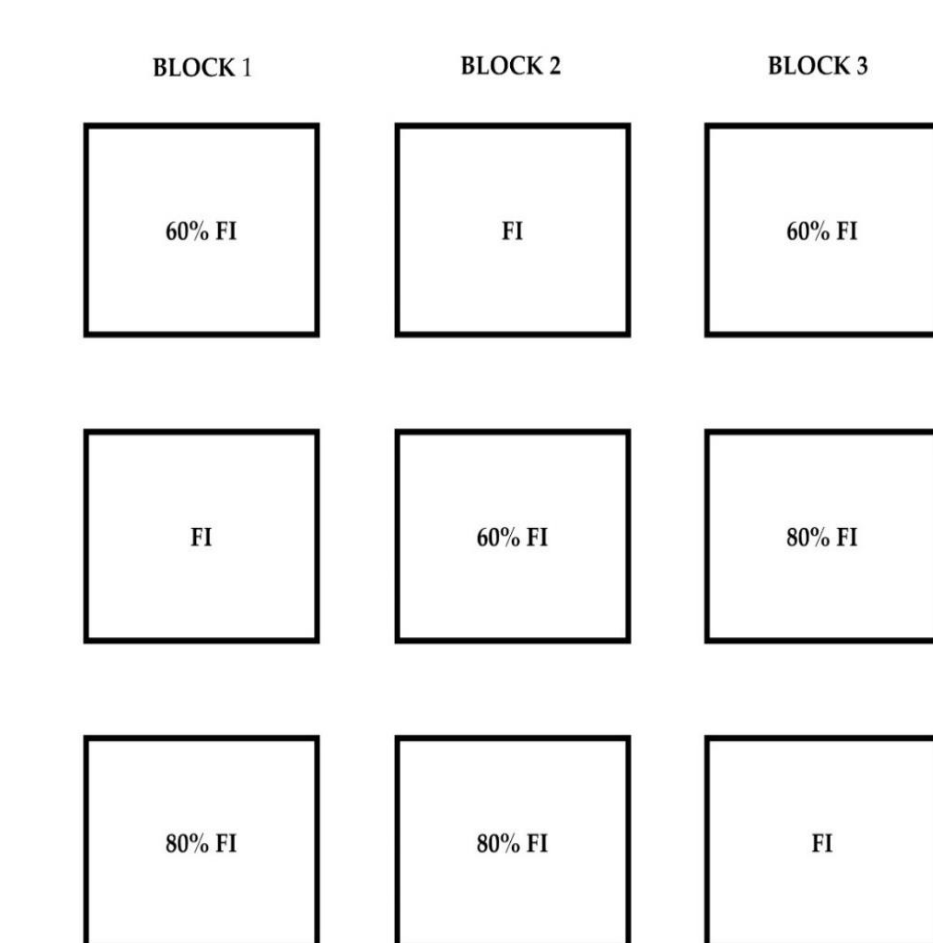


Fig. 2. Layout of the experimental plots

Highlights



Under moderately limited irrigation the above-ground biomass and the grain yield of maize are reduced while the water productivity is slightly increased.

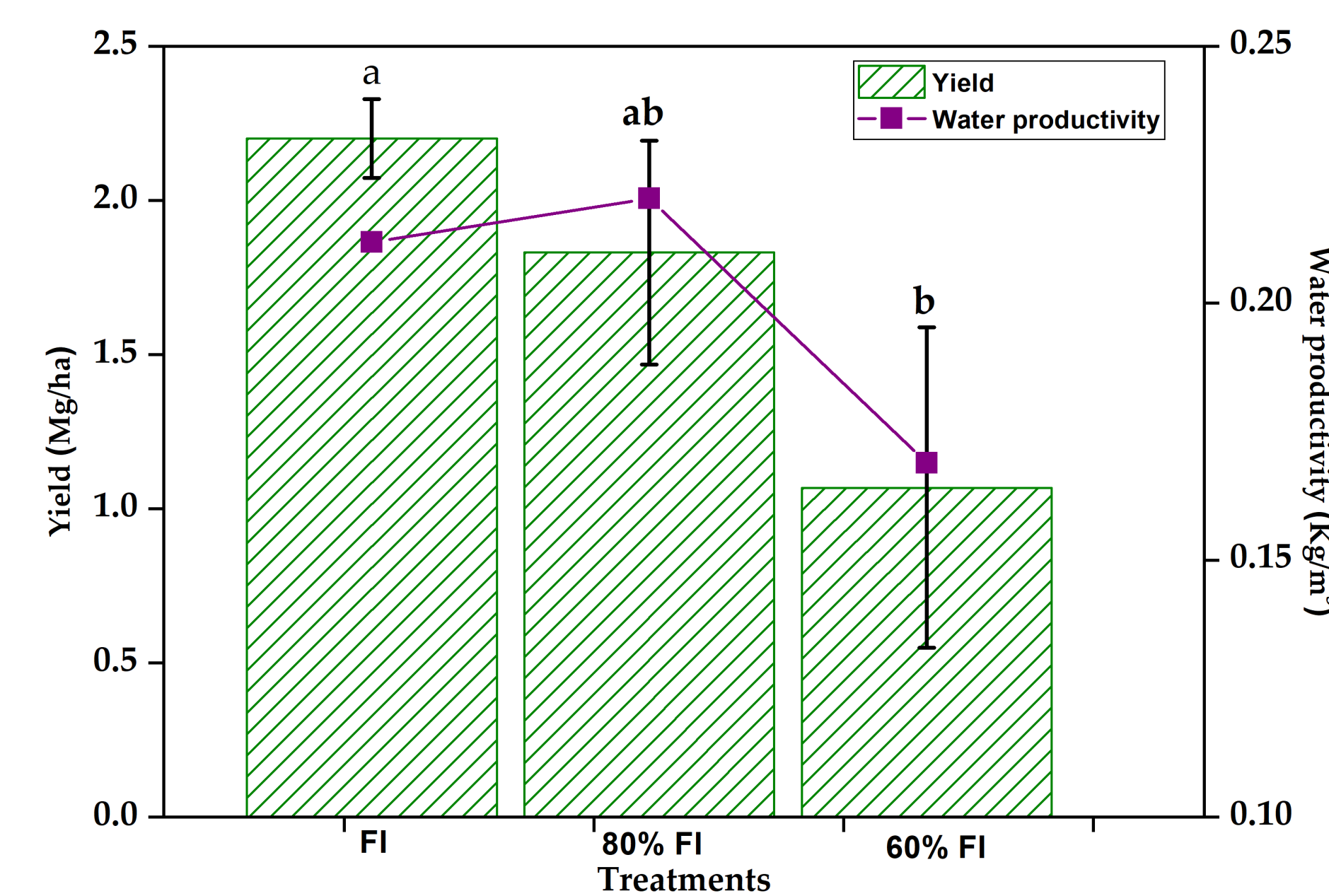


Fig. 5. Maize yield and water productivity

Deficit irrigation strategies must be carefully managed since slight differences in the application volumes affect the above-ground biomass and grain yield of maize significantly.



To download the full paper:

Gadédjisso-Tossou et al. Water 2018, 10(12), 1803; <https://doi.org/10.3390/w10121803>

Results

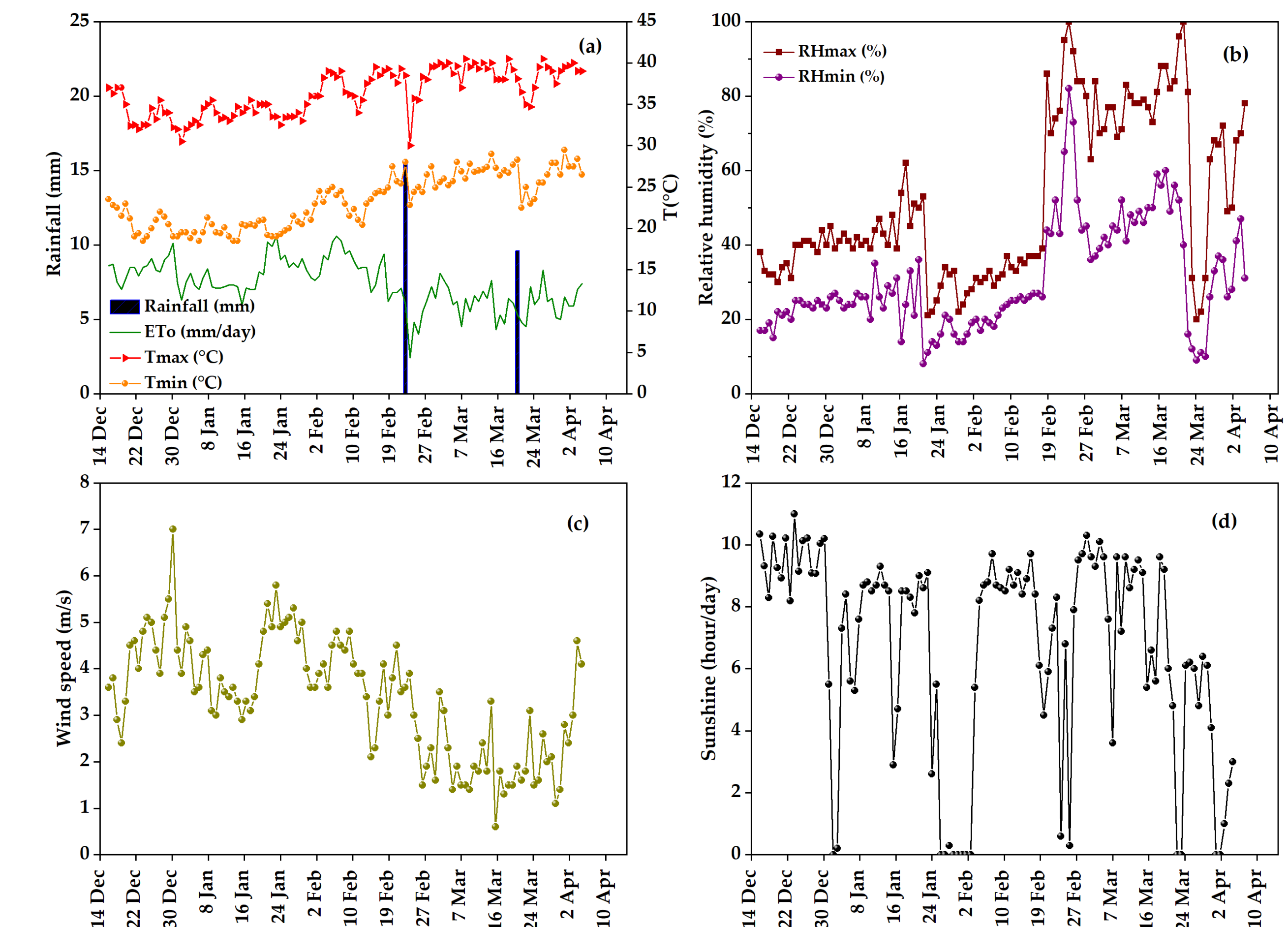


Fig. 3. Weather conditions during the experiment period

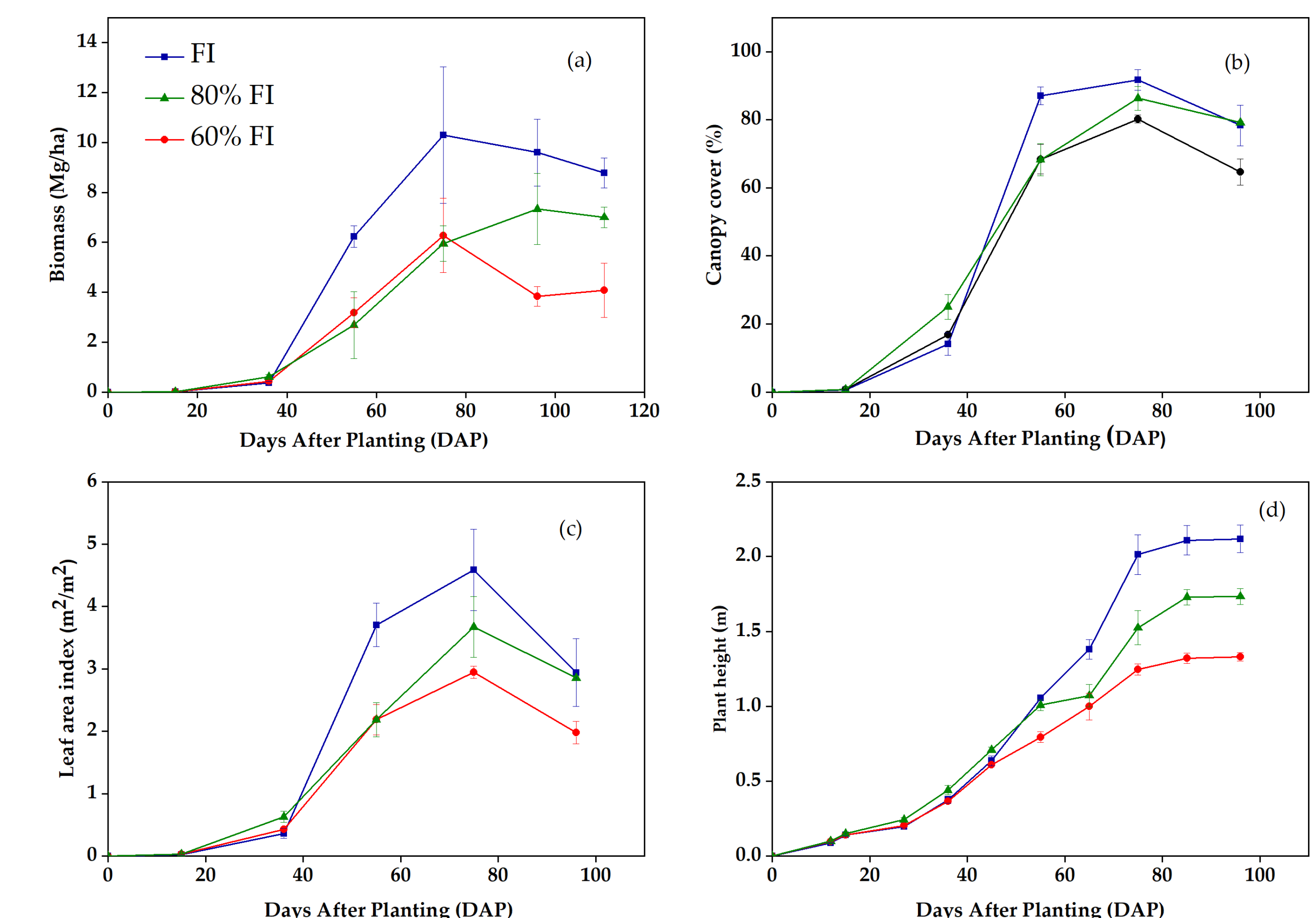


Fig. 4. Effect of irrigation levels on maize plant parameters

Table 1. Crop evapotranspiration, depth of water applied in the growth stages and harvest index

Growth stages	Period (days)	Volume of water applied (mm)			ETc (mm)
		FI	80% FI	60% FI	
Initial	20	193.8	155.3	137.8	82.4
Development	30	280.2	224.3	157.3	203.7
Mid-season	46	507	405.5	303.5	385.8
Late-season	15	57.5	46	34	83.3
Total	111	1038.5	831.1	632.6	755.2
Harvest Index	—	FI	80% FI	60% FI	Mean
	—	26.08	25.41	24.61	25.37