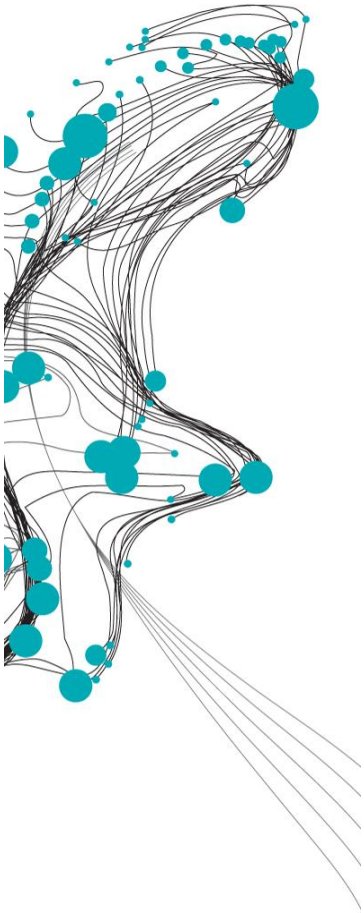
MARGINAL ECONOMIC VALUE OF WATER IN CROP PRODUCTION



This study explores the effect of two types of management practices on the average and marginal water productivities. The management practices are three irrigation techniques (furrow, sprinkler, and drip irrigation) and two mulching practices (no mulching and organic mulching). A case for an arid environment around Tunis with sandy loam soil for two crop types (wheat and maize) was considered. The AquaCrop model was used to simulate the soil-water-balance and crop yield. A comparison was made on how changing the management practices affect the crop yield and irrigation requirement, which ultimately also affect the average and marginal water productivities.

Table 1. Research model: management practices considered in a number of cases to simulate the effect on Average Water Productivity (AWP) and Marginal Water Productivity (MWP)

Management practices	Modeling	Effects
Three irrigation techniques: furrow, sprinkler and drip irrigation	Soil water balance and crop growth model (AquaCrop)	AWP MWP
Two mulching practices: no mulching and organic mulching		

For all the management practices implemented, the maximum crop yield attained remained the same but they all achieved this maximum with different irrigation requirement. Drip irrigation required the least amount followed by furrow and sprinkler irrigation, respectively. Moreover, the maximum average water productivity is also the highest for drip irrigation and it is also reached with the least amount of water. However, for the marginal water productivity, switching between management practices did not affect the maximum value but the volume of water required to attain this maximum was also the least in the case of drip irrigation. The results obtained apply for both crops (wheat and maize). The only difference is the magnitudes of values but the shapes of the production and productivity curves are similar for both crops. In addition, by partially satisfying the crop's evaporative requirement we found out it is possible to save considerable amount of water with no reduction in the maximum crop yield.

Table 2 Amount of irrigation water saved using the different management practices for wheat and maize

Irrigation technique	Mulching practice	Irrigation water saved (m^3/ha)	
		Wheat	Maize
Furrow	No mulching	1135	1512
	Organic mulching	1123	1499
Sprinkler	No mulching	1137	1495
	Organic mulching	1109	1504
Drip	No mulching Organic mulching	1138	1587

Furthermore, when there is scarcity of land or water, we can maximize the crop production using two different approaches. When land is scarce, we make sure we effectively use all the land we have and we irrigate at maximum yield in order to get the most out of the available land. Conversely, when water is scarce, we have to aim for maximum average water productivity as that will result in maximizing our crop production.

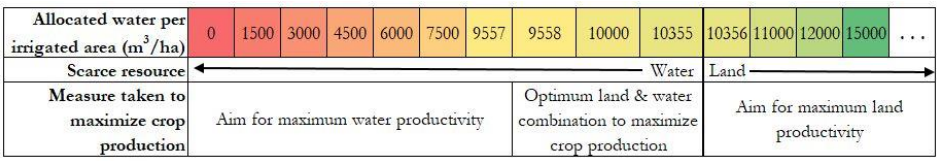


Figure 1 Heat map showing how crop production can be maximized under scarcity

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