

'More crop per drop': how to make it acceptable for farmers?

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1. Abstract

In countries facing water scarcity, governmental water agencies try to transfer this constraint to farmers, e.g. by inciting farmers to shift from traditional to localized irrigation methods to save water. However, water shortage is often much less felt by farmers than soil limitations, their objective being mostly to maximize their income per cultivated area (US\$ per ha rather than per m³ of water). This discrepancy can only be solved if governments find ways to 'transfer' water scarcity, e.g. through economic incentives such as water pricing and/or subsidies. The aim of this study was to bring some discussion elements to the question of how to match both water managers and farmer's interest. We aimed particularly at evaluating to which extent shifting to drip irrigation is a relevant way to save water and increase farmer's income.

This stood on an analysis of crops net productivity considering interactions between economic, environmental, technical and methodological parameters. We focused on the study case of Turkey considering two crops with contrasted gross productivity: tomato and cotton, characterized by partial vegetation cover during a large part of crop cycle. A 3D crop energy balance model was applied showing that crop transpiration is increased by up to 10% when shifting from furrow to drip irrigation. These results were used to correct the ET_m estimated with the Kc method and thus to provide more accurate values of crops net productivity both with furrow or drip irrigation.

By this way drip irrigation appeared definitely relevant when considering high value crops as tomato. Inversely, the divergences between farmer and water manager's interests are amplified with low-medium value crops as cotton; the combination between water pricing and subsidies could be a way of agreement, but with irrigation equipment subsidies of at least 40 percent (for low water tariff) to 60 percent (around sustainable water price) to make the transfer from furrow to drip irrigation acceptable. This approach appeared generic enough to be applied in other economic, technical or environmental conditions, to modernize irrigation by harmonizing constraints faced by governments and farmers.

2. Key words

Drip and furrow irrigation, water saving, evapotranspiration modeling, crop productivity, water price.