

# Assessment of water productivity in the arid environment

## Case of citrus in Souss region, Morocco

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This work was conducted in the Souss region, known by severe water scarcity and a high agricultural activity dominated by the citrus (representing 40% of the area of Morocco's citrus). The objective of this work is to diagnose the current situation of the water efficiency in citrus irrigation and analyze the impact of various production factors on water productivity and its sustainability in the context of climate change.

A field survey was conducted on 125 farms covering an area of 4933 ha. The stratification method was adopted as a sampling frame. The farms studied are more or less unevenly distributed according to the selected area classes: [0-5 ha [, [10-20 ha [, [20-50ha [and more than 50 ha. The result indicates that the use of water shows a huge shortfall. since 31% of farms in the region are still using surface irrigation system with an average water supply of 12157 m<sup>3</sup> / ha. Although drip irrigation system saves 25% of water, this system is still using excessive water (9127 m<sup>3</sup> / ha) and 67% of farms are still using only the experience of the manager to control and adjust irrigation.

The assessment of water productivity showed a value of 1.2 kg/m<sup>3</sup> for surface irrigation and 3.8 kg/m<sup>3</sup> for drip irrigation. The use of tools for control and adjustment of irrigation increases the water productivity of drip irrigation by 25%. The availability of the technical staff (internal or external) allows an increase in productivity of 172.4% compared to farms without technical advice. The agronomic water productivity was three times greater with drip irrigation system (3.2 kg / m<sup>3</sup>) compared to surface irrigation system (1 kg / m<sup>3</sup>). Moreover, with drip irrigation, the agronomic water productivity becomes three times greater if there is a technical supervision and five times more important if a technical staff is permanent on the farm.

The gross economic water productivity is strongly influenced by the irrigation method since it was 0.26 € / m<sup>3</sup> for citrus production with surface irrigation against 1.07 € / m<sup>3</sup> for citrus production with drip irrigation. However, the net economic water productivity for surface irrigation is almost null while it is 0.63 € / m<sup>3</sup> for drip irrigation. Concerning the effect of varieties groups, oranges recorded 4.35 kg / m<sup>3</sup> as agronomic water productivity against 2.74 kg / m<sup>3</sup> for the small fruits. This difference is mainly due to the difference in yield between the two groups. For the gross economic water productivity, the two groups showed a similar level. However, in terms of net economic water productivity, oranges recorded 0.66 € / m<sup>3</sup> against 0.56 € / m<sup>3</sup> for small fruits.

**Keywords.** Irrigation - Citrus - Water productivity – Trickle irrigation - Efficiency.