

Increase globe artichoke cropping sustainability using sub-surface drip-irrigation systems in a Mediterranean coastal area for reducing groundwater withdrawal

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During the last decades in coastal areas of the Mediterranean basin, human growth posed severe stresses on freshwater resources due to increasing demand by agricultural, industrial and civil activities, in particular on groundwater. This in turn led to worsening of water quality, loss/reduction of wetlands, up to soil salinization and abandonment of agricultural areas.

Within the EU LIFE REWAT project a number of demonstration measures will take place in the lower Cornia valley (Livorno, Italy), both structural (pilot) and non-structural (education, dissemination and capacity building), aiming at achieving sustainable and participated water management. In particular, the five demonstration actions are related to: (1) set up of a managed aquifer recharge facility, (2) restoration of a Cornia river reach, (3) water saving in the civil water supply sector, (4) water saving in agriculture, (5) reuse of treated wastewater for irrigation purposes. Thus, the REWAT project general objective is to develop a new model of governance for sustainable development of the lower Cornia valley based on the water asset at its core.

As per water use in agriculture, the lower Cornia valley is well known for the horticultural production. In this regard, globe artichoke (*Cynara cardunculus* L. var. *scolymus* L. (Fiori)) crops, a perennial cool-season vegetable, cover a surface of about 600 ha. In order to increase stability and productivity of the crop, about 2000 – 4000 m³ ha⁻¹ yr⁻¹ of irrigation water is required. Recent studies demonstrated that yield of different crops increases using Sub-surface Drip-Irrigation (SDI) system under high frequency irrigation management enhancing water use efficiency. In the SDI systems, the irrigation water is delivered to the plant root zone, below the soil surface by buried plastic tubes containing embedded emitters located at regular spacing.

Within the LIFE REWAT, the specific objectives of the pilot on irrigation efficiency is to (i) demonstrate the suitability of SDI for globe artichoke cultivation, reducing the water consumption, while maintaining (or even increasing) crop production and (ii) assess the crop water use efficiency respect to surface drip-irrigation.

The field test is located in Venturina (Italy) and it covers a surface of 4 ha. The soil is characterized by sandy-loam texture, 1.72% of organic matter at 7.81 pH. Groundwater is the main source of supply for irrigation. By the chemical point of view, a monitoring campaign in spring 2016 showed a neutral pH of 7.2, electrical conductivity of 1363 µS/cm, 373 and 243 mg/l of total sulphate and carbonate, respectively, thus demonstrating the suitability of groundwater for SDI application.

The SDI system was implemented at the beginning of September 2016. The sub-surface buried pipelines, were placed at 0.25 m depth, with emitters spaced 0.5 m. The distance between pipelines was 1.5 m, according to globe artichoke layout (1.5 m between rows, 1 m in-row spacing). Surface-buried tubes were placed in an area about 0.75 ha wide for the comparison with SDI. Artichoke var. Terom were transplanted after the SDI operation test. In the next 3 years, both crop productivity and water use will be assessed. Results will be presented and discussed with the whole farmer's community.

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