

Drip irrigation and fertigation in maize: farm analysis and projects

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Irrigation is an essential agronomic practice to satisfy the increasing demand for agricultural products. Water shortage obliges to increase water use efficiency. Drip irrigation and fertigation have been recognised as efficient method for watering crops. This work aimed at evaluating the application of such techniques in maize production, evaluating the agronomic, economical and managerial consequences.

The experiments were conducted in 2014 and 2015, in some farms located in Mazzè, Villareggia (TO) and Savigliano (CN), north-west Italy. In 2014 in Mazzè and in 2014 and 2015 in Villareggia furrow irrigation, drip irrigation with usual fertilisation management and drip fertigation were compared on grain maize. In 2015 in Mazzè, the fertigation system was set up on a silage maize hybrids comparison field. In Savigliano, on silage maize, drip irrigation with usual fertilisation management was compared to drip fertigation, combined or not with a lower initial nitrogen input. In Savigliano, drip irrigation system was evaluated and water distribution uniformity was shown to be good. Crop development during the growing season was monitored using proximal optical sensors. In particular, GreenSeeker was used at early growth stages, and Hydro-N-Tester after canopy closure. During the rainy summer of 2014 no differences among the treatments were recorded. Conversely, in 2015 the fertigated plots showed a higher N-Tester index. However, only in Villareggia in 2015 the fertigated plot showed a grain yield increase when compared to the others. The experimental set in Mazzè and Villareggia

show that drip irrigation increases Water Use Efficiency (WUE) and that fertigation increases Nitrogen Use Efficiency (NUE). Moreover, in Savigliano, it was highlighted that fertigation allowed reducing sidedress nitrogen inputs supplied during ridge tillage, without negatively impacting maize yield. An economic analysis was conducted to compare two efficient irrigation methods, i.e. sprinkler and drip irrigation.

The cost of irrigation with centre - pivot, with hose - reel irrigation machine and drip irrigation were calculated. Centre - pivot resulted the cheapest technique, but its main application limit is land fragmentation. Hose - reel irrigation machine had instead higher costs, due to higher energy consumption. Moreover, such irrigation method requires the operator's work during the irrigation events to move the irrigation machinery. Drip irrigation showed the highest costs, mainly due to the annual drip line replacement.

Drip irrigation and fertigation allow a sustainable intensification of maize production, improving WUE and NUE. However, their territorial spread is still limited. The main barrier is the high cost of the drip irrigation system, as well as rotating irrigation that imposes an excessive time interval between two successive irrigation events.