Environmental Engineering and Management Journal *October 2019, Vol. 18, No. 10, 2273-2285*
http://www.eemj.icpm.tuiasi.ro/; http://www.eemj.eu

"Gheorghe Asachi" Technical University of Iasi, Romania

SMART WATER AND SOIL-SALINITY MANAGEMENT IN AGRO-WETLANDS

Marinella Masina[1*], Roberta Calone[2], Lorenzo Barbanti[2], Claudio Mazzotti[3], Alberto Lamberti[1], Maria Speranza[2]

[1]Alma Mater Studiorum Università di Bologna, Dipartimento di Ingegneria Civile, Chimica, Ambientale e dei Materiali - DICAM, viale del Risorgimento 2, 40136 Bologna, Italy
[2]Alma Mater Studiorum Università di Bologna, Dipartimento di Scienze e Tecnologie Agro-Alimentari - DISTAL, viale G. Fanin 44, 40127 Bologna, Italy
[3]Agrisfera S.Coop.Agr.p.a., via B. Nigrisoli 46, 48123 S. Alberto Ravenna, Italy

Abstract

Soil salinization is becoming worldwide one of the most serious land degradation issues. Seawater intrusion in upper aquifers is responsible for the largest proportion of salt-affected agricultural lands in coastal areas. In this study, the impact of different irrigation strategies on the salinity of a maize cultivated field located in the coastal plain of Ravenna, Italy, was simulated with the FAO AquaCrop model. Model calibration was supported by comparison with remote-sensed and field collected crop data. Ten irrigation scenarios were tested by varying the irrigation season length, the soil moisture threshold for irrigation (TI), and the irrigation depth (ID), in presence or absence of flooded pipe drains (FD) to create a fresh-water lens preventing salt rising from brackish groundwater.
FD show to be more effective in countering soil salinization than strategies exclusively based on supplying enough water to obtain salt leaching (SL). The best result, in terms of both fodder maize yield and salinization control, is achieved with the combination: FD immediately after sowing, irrigation inhibited in May, TI set at 50% of soil readily available water (RAW), and ID modulated to exceed field capacity and obtain SL. The worse strategy is revealed to be the non-FD scenario, coupled with no irrigation in May and August, TI ranging between 65 and 80% of soil RAW depletion, and ID set at 50 mm. Even if water-conservative, this approach results in high soil salinization and leads to significant yield decrease.

Key words: AquaCrop, groundwater, irrigation, maize, soil salinity

Received: August, 2019; Revised final: September, 2019; Accepted: October, 2019; Published in final edited form: October, 2019

[*] Author to whom all correspondence should be addressed: e-mail: marinella.masina2@unibo.it.