



Co-financed by Greece and the European Union

“CASCADE HYDROPONICS”

An integrated approach to increase productivity, resource use efficiency and sustainability of protected horticulture

Cash

Deliverable 5- [3.1.1]: *[Adapted fertigation model]*

Version 1.0: *first version delivered on 28-03-2019*

*This project is co-financed by the European Union and Greek national funds through the bilateral Greece-Germany S & T Cooperation Program, Competitiveness, Entrepreneurship & Innovation (EPAN EK) (project code: **T2DGE-0893**).*

Project Details:

Programme: Bilateral Greece-Germany S & T Cooperation Program, Competitiveness, Entrepreneurship & Innovation

Project Title: An integrated approach to increase productivity, resource use efficiency and sustainability of protected horticulture CasH

Project Acronym: CasH

Project Number: T2DGE-0893

Time Frame: 29/05/2018 – 28/05/2021

Deliverable Details

WP: [WP3-Cultivation practices]

Task(s): [T3.1: [Evaluation of primary crops]

Deliverable Title: [Adapted fertigation model]

Type: Prototype, Confidential, only for members of the consortium (including the Commission Services)

Lead beneficiary: [University of Thessaly]

Involved Partners: [Hochschule Geisenheim University]

Deadline for delivery: month [10], [28/03/2019]

Date of delivery: 28/03/2019

D5 [3.1.1]: [Adapted fertigation model]

“CASCADE HYDROPONICS”



Table of Contents

1.	Summary	3
2.	Introduction	4
3.	Adaptation of the fertigation model for the primary crop	5
3.1	Experimental set-up and measurements	5
3.2	Input and output analysis	7
4.	Reference	17

List of Figures

Figure 1.	The progress of electrical conductivity (EC) expressed in dS m^{-1} , concerning the irrigation nutrient solution (IS) and the drained nutrient solution (DS) during the growing period of cucumber and tomato cultivation.....	9
Figure 2.	The progress of the pH level concerning the IS and the DS during the growing period of cucumber and tomato cultivation.....	10

List of Tables

Table 1.	The total amount of NS irrigated (IS), absorbed (AS) and drained (DS) by the cucumber and tomato plants during 57 DAT. Absorption and drainage rate of each crop as a percentage of the applied values.	8
Table 2.	Mean values of the concentration of elements, expressed in mM L^{-1} for the IS, AS and DS performed in cucumber plants.	11
Table 3.	Mean values of the concentration of elements, expressed in mM L^{-1} for the IS, AS and DS performed in tomato plants.....	12
Table 4.	The concentration of the nutrient's elements in the drainage solution [Cdr(i)] of the cucumber and tomato plants and the optimum nutrients' concentration values that should be performed [Ctar(i)] on more salt tolerant plants, such as mint and basil (secondary crops).	14
Table 5.	percentage of primary crop elements recovery from the target "secondary" solution.....	15

D5 [3.1.1]: [Adapted fertigation model]

“CASCADE HYDROPONICS”



1. Summary

In soilless culture, especially in closed-loop hydroponic systems offers a great option for reducing environmental and economic costs. (Massa et al., 2011; Katsoulas et al., 2015). The reuse and the recirculation of Fertigation solution is an increasing need but the nutrient management is one of the biggest challenges in Hydroponics. Monitoring ions in solution, at frequent intervals at various growth stages of crops, is extremely expensive (Bugbee, 2004) however, can provide sufficient information about ion imbalances in hydroponic solutions and this may result in rich yields and high market value products. Other option is recommended the solution composition (the ratio of nutrients) and concentration. Consequently, to facilitate the practical application of nutrient management a Decision Support System (DSS) will be adapted in the Head Unit. It is necessary to indentify general inputs and outputs that will characterize the core of the DSS for regional planning. In this workpackage **[WP3]** [Cultivation practices] we are interested in identifying requirements for the decision support system. Therefore, we consider as DSS inputs for secondary crop the outputs of primary crop. Indeed, the DSS should provide assistance regarding the selection of suitable primary, secondary and tertiary crops as well as Fertigation Control, generally. So, the current deliverable **[D5_(3.1.1)]**, entitled "Adapted fertigation model", will estimate the nutrient needs (outputs) for the crops and develop an appropriate refill solution. The objective is to evolve a recipe for a refill solution that replenishes both nutrients and the water. Plants have evolved to tolerate large nutrient imbalances in the root zone, but in recirculating hydroponic systems, imbalances in nutrient replenishment are cumulative. It is thus important to understand the principles for nutrient replacement, especially when the solution is continuously recycled over the life cycle of a crop. (Bugbee, 2004).

D5 [3.1.1]: [Adapted fertigation model]

"CASCADE HYDROPONICS"

The deliverable is available upon request

Please send e-mail to the project coordinator: nkatsoul@uth.gr