MS3. Establishing a protocol for the experimental evaluation of the offline version of the NUTRISENSE SW (Due in M12)

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The aim of this protocol is to experimentally evaluate the efficiency of the internet version of NUTRISENSE to maintain the nutrient concentrations in the root environment close to target values by regular readjustment of the supplied NS. The following steps are followed.

A greenhouse plant species is cultivated in eight independent soilless cultivation units allocated into two groups with four units per group (2×4). Each group of four hydroponic units is treated differently concerning the supply of nutrient solution (NS). Thus, two different treatments concerning the management of nutrient supply are applied, with four replications per treatment.

In the first group of hydroponic units (1st treatment), a standard NS for the particular crop species is supplied, and its composition in modified only when the plant developmental stage changes (e.g., when the plant passes from the vegetative to the reproductive stage), based on standard recommendations.

In the second group of hydroponic units (2nd treatment), the composition of the supplied NS is computed using NUTRISENSE (https://nutrisense.online/), after introduction of the following information to the software: a) crop species, b) season of the year, c) mineral composition of the irrigation water used to prepare the NS. Every two weeks, a sample of drainage solution (DS) is collected from each of the four hydroponic units and the concentrations of K, Ca, Mg NH_4-N, NO_3-N, P, Fe, Mn, Zn, Cu, B, Cl, Na and HCO_3^- are determined. Based on these data, the concentration of SO_4-S is estimated based on the electrochemical balance between anions and cations. The obtained analytical data are introduced to NUTRISENSE, and a readjusted nutrient solution composition is obtained, which is immediately prepared and used to fertigate the crop.

Every two weeks, new samples of DS are collected and analyzed, and the data are used to readjust again the composition of the supplied NS. The minimum duration of the experimental crops is eight weeks, which means that the composition of the supplied NS is readjusted six times through NUTRISENSE.

Samples of DS are collected also from the first treatment (standard NS) at each sampling date and used to determine the concentrations of the same nutrients and non-nutrient ions as in the second treatment (NUTRISENSE). However, in the standard NS treatment, these data are not used to modify the standard NS supply during the cropping period.

The evolution of the nutrient and non-nutrient ion concentrations over time in the DS are presented in figures for both treatments. In the same figures, the target concentration of the particular nutrient in the root environment, based on standard recommendations in the relevant literature, are also displayed, to compare the two strategies concerning the management of nutrient supply to the crops.