Assessment of capacity sensors for monitoring soil water content in ecological orchards

Karina Patrícia Prazeres Marques (1), Daniel Horcajo (2), and Leonor Rodriguez-Sinobas (2)

(1) Federal University of Pernambuco, Department of Geographical Sciences, Recife, Pernambuco, Brazil, karina_prazeres@hotmail.com, (2) Technical University of Madrid, School of Agricultural Engineering, Madrid, Spain, leonor.rodriguez.sinobas@upm.es, d.horcajo@alumnos.upm.es.

Water is an important element for soil tillage and crop development. Its proper management is essential for the development of plants, by preventing excess or shortage in water application. Soil water content is affected by the soil-water-plant system and its monitoring is a required within a sustainable agriculture framework respectful with the natural environment. Thus, the aim of this study was to evaluate the performance of capacitive sensors in monitoring soil moisture from organic orchards. An experimental text was carried out at the Hydraulics Laboratory of the Agricultural Engineering School in the Polytechnic University of Madrid (Spain). Soil samples were collected within the 0-20 cm depth layers from the university organic orchard. The samples were air dried and subsequently sieved in a 2 mm mesh sieve, removing roots and coarse fractions and keeping the fine soil. The amount of fine soil was calculated from the soil density and the soil samples were compacted to obtain the relative volume that corresponded to their density. The measurements were carried out in dry and in saturated soil and, also in samples where soil was stirring with: 150 cm^3, 300 cm^3 and 450 cm^3 of water. A 1890 ml container was used to hold the fine soil and the soil moisture sensor ECH_2O, type 10 HS (Decagon Devices, Inc.) was placed horizontally at 5 cm depth. Soil water readings were recorded on a datalogger Em5b from the same manufacturer. The results showed that the capacitive sensor has a linear response to soil moisture content. Its value was overestimated in comparison to the volumetric values and the largest errors (about 8%) were observed in the soils with high moisture contents. Overall, these results point out that the ECH_2O sensor, model 10 HS, could determine with sufficient accuracy the volumetric soil water content from organic orchards although it could be further improved by "in situ" calibration.