INTRODUCTION

A Site-specific management (SSM) is a form of precision agriculture whereby decisions on resource application and agronomic practices are improved to better match soil and crop requirements as they vary in the field. SSM enables the identification of regions (homogeneous management zones) within the area delimited by field boundaries. These subfield regions constitute areas that have similar permanent characteristics. Traditional soil and pasture sampling and the necessary laboratory analysis are time-consuming, labour-intensive and cost prohibitive, not viable from a SSM perspective because it needs a large number of soil and pasture samples in order to achieve a good representation of soil properties, nutrient levels and pasture quality and productivity.

OBJECTIVE

The main objective of this work was to evaluate technologies which have potential for monitoring aspects related to spatial and temporal variability of soil nutrients and pasture green and dry matter yield (respectively, GM and DM, in kg/ha) and support the farmer decision making.

SENSORS

Three types of sensors were evaluated in a 7ha pasture experimental field: an electromagnetic induction sensor (“DUALEM 1S”, which measures the soil apparent electrical conductivity (ECa)), an active optical sensor (“OptRx®”, which measures the NDVI, “Normalized Difference Vegetation Index”) and a capacitance probe (“GrassMaster II” which estimates plant mass).

RESULTS

The data obtained in the experiments carried out in “Silveira” site (2015 and 2016) were analyzed with ArcGIS 10.2 software to produce the correspondent maps. Figures show the spatial patterns of sensors, soil and pasture parameters. The Pearson correlation coefficient was used to evaluate the relationship between sensors, soil and pasture parameters. Significant correlations were obtained between the ECa and soil parameters. Also significant and very strong correlations were obtained between capacitance (CMR) and NDVI and between any of these parameters and the pasture productivity (GM and DM).

CONCLUSIONS

- Today, agriculture faces challenges related to competitiveness and sustainability which demand by the farm manager up-to-date knowledge of the existing options for optimizing the productive process. Technologies are available for all the different stages of the process of Precision Agriculture (PA).

- The results of this study indicate the possibility of using a soil electrical conductivity probe as, probably, the best tool for monitoring some of the characteristics of the soil, which could represent an important help in simplifying the process of soil sampling and support SSM decision making in PA projects.

- The significant and very strong correlations obtained between capacitance (CMR) and NDVI and between any of these parameters and the pasture productivity (GM and DM) shows the potential of these tools for monitoring the evolution of spatial and temporal patterns of the vegetative growth of biodiverse pasture, for identifying different plant species and variability in pasture yield in Alentejo dry-land farming systems.

- These results are relevant for the selection of an adequate sensing system for a particular application and open new perspectives for other works that would allow the testing, calibration and validation of the sensors in a wider range of pasture production conditions, namely the extraordinary diversity of botanical species that are characteristic of the Mediterranean region at the different periods of the year.

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