POSTER SUMMARY

PRECISION AGRICULTURE INFORMATION SYSTEM BASED ON WIRELESS SENSOR NETWORKS: A PROPOSAL

OROZCO OA, LUBO CM, RODRÍGUEZ LM, ABADÍA J, LÓPEZ A AND LLANO G

Universidad Icesi, 18th Street # 122-135, Cali, Colombia, ***760031***

oaorozco@icesi.edu.co cmlubo@icesi.edu.co lmrodriguez@icesi.edu.co
julieth.abadia@correo.icesi.edu.co alopez@icesi.edu.co gllano@icesi.edu.co

Abstract

In Colombia, sugarcane represents one of the main agricultural crops, with about 226,000 hectares cultivated. This crop is therefore essential to the development of the country, and general improvements in cultivation processes are needed to achieve cleaner production processes. Presented here is a novel prototype of an information system based on wireless sensor networks (WSN) to measure climatic variables such as temperature, and soil and air moisture. Also measured are soil pH and the most relevant greenhouse gases (GHG), which are carbon dioxide (CO_2), methane (NH_4) and nitrous oxide (N_2O). These gas levels will be measured and quantified in a sugarcane field trial located in the Valle del Cauca state, by pursuing a characterisation of the carbon footprint of the crop. These measurements will be carried out with the aim of comparing the results with those obtained from a parallel process, where the closed chamber technique was used to measure the GHG. The climatic variables are measured also to keep a record of the conditions where the gases are measured. This is done to present a correct comparison between the data obtained from the sensors and that obtained manually from the closed chamber technique. These measurements will be performed on a 1 hectare plot, in order to assess the potential of the presented prototype. The WSN is based on the Arduino platform for gathering data from the sensors, and uses XBee modules to transmit the data into the farm's computer where it is displayed. The device is powered by solar energy and its main purpose is to supply information on the actual crop status and variable levels to reduce the carbon footprint of the cultivation process of the crop. The people in charge of the farm can then consider the data collected by the sensors to make improvements in the use of fertilisers and irrigation water. It is expected that the implementation of the WSN prototype will take place in an organic sugarcane plot with features of conservation agriculture (CA) (i.e. minimal mechanical soil tillage, use of organic fertilisers, avoidance of soil degradation, and presence of sugarcane leaves as mulch) to compare the greenhouse gas emissions obtained from the parallel project with those obtained from the sensors.

The main reason for measuring the GHG concentration in the air is to present a parallel between WSN measurements and those obtained manually, in an effort to complement the information to characterise the potential carbon footprint of 1 ha of organic sugarcane, given its CA procedures. Although 1 ha is a large area to cover with only five sensors, the diagonal distribution is adequate to cover the entire area and present an accurate approximation of the GHG emissions from the labours associated with the crop.

Keywords: Arduino, carbon footprint, greenhouse gas, information system, sugarcane, wireless sensor networks