Arduino based soil moisture analyzer as an effective way for irrigation scheduling

Seeralakandapalan Sayanthan
Department of Agricultural Engineering
University of Jaffna
Killinochchi, Sri Lanka
mylvaganam90@gmail.com

Tharmarajah Thiruvaran
Department of Electrical and Electronic Engineering
University of Jaffna
Killinochchi, Sri Lanka
Thiruvaran@gmail.com

Nadarajah Kannan
Department of Agricultural Engineering
University of Jaffna
Killinochchi, Sri Lanka
aenkanna@gmail.com

ABSTRACT

Through the present study we vindicated the crop water requirement for eggplant by using Arduino based soil moisture investigator and compared the total water requirement with the quantity of water being applied by farmers to save such excess quantity of water being wasted by the farmers. Therefore a device was established in the Arduino platform in order to detect the soil moisture, as the moisture sensor shows only the resistance between the two probes. It was calibrated with direct moisture meter to obtain the moisture readings directly. Then selected egg plants were planted in two drip fixed fields in two different times. Such time variation in planting was maintained to facilitate the root study in one field before the irrigation of the test field. Hence, according to the measured root length the soil moisture sensors were inserted into the soil in the test field and plants were irrigated up to the field capacity by using the moisture detection. The measured quantity of water which is actually needed by an eggplant up to 108 days after planting was around 149.26 liter. Simultaneously an investigation was carried out to find the quantity of water being applied by farmers. Finally. The measured quantity of water being applied by the farmers was 604.8 liter and it is 4.05 times higher than actual water requirement. Therefore, by using this soil moisture sensing technique it is possible to save a huge amount of water.

Key words – Process control, Crop water requirement, Eggplant, irrigation interval.

I. INTRODUCTION

All living beings including human are strictly relying on water for survival. Therefore, ensuring the satisfactory supply of water is essential for the wellbeing of this globe [1]. With the world population increment, the available water is getting depleted mainly due to the industrial activities. Agriculture is having a prominent role in such depreciation. In many developing nations irrigation accounts for 90% water withdrawn from available sources of use. In the meantime recent studies convey that around 800 million people in developing world are privation of sufficient nutrition [2], In order to rectify these issues we are in a hurry to increase the food production with the assurance of water sustainability.

Irrigated agriculture has a prominent role in food production but most of the time it is with complete disregard to basic principle of resource sustainability. Most of the famers irrigate their fields with excess amount of water Therefore, irrigation water management in an era of water paucity will have to be carried out most competently, focusing at saving water and at maximizing its productivity.

Precision irrigation is possible only after the measurement of plant water requirement. There are various approaches of crop water measurements deal with soil, plant, atmospheric or microclimatic parameters. However within all parameters soil related measurements; soil moisture sensing is more viable which uses dielectric properties of the soil as it is auto-dynamic as it is not affected by the environmental manipulations and easy accessible [3] Evidence are documented that they were Therefore switching tensiometers were in the usage to find out the soil moisture state and to automate the irrigation in between two different predetermined matrix potentials in tomatoes, citrus, and Bermuda grass [4,5]. But there are some drawback in using these tensitometers, were demonstrated by Smajstrla and Koo (1986) such as entrapped air in the tensiometers, organic growth on the ceramic cups, and the need for recalibration [4]. Hence with the introduction of solid soil moisture sensing probes the above mentioned constrains were asphyxiated and these types of sensors have been used for the crops such as onion and potato [6] and for urban landscapes [7]. Generally, these sensors have been found to involve less maintenance than traditional tensiometers.

Over the last decades the soil moisture sensing field has advanced immensely, the reasons for the advancement can be seen in two distinct ways. The first one is the improvement of computer technology along with powerful, handy integrated circuits developments and the second one is the significant advances in the application of electromagnetic methods for the measurement of soil water availability [8]

Even though there are more researches regarding the soil moister sensing and automation in irrigation, still there is a gap in the concept of precision irrigation with the concern of plant water requirement.

Therefore our objectives of the study were to measure the crop water requirement of eggplant by using the prepared

978-1-5386-9418-3/18/$31.00 ©2018 IEEE