An Automatic Irrigation System for Commercial Production of Advanced Planting Materials

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Introduction

Horticulture is widely practiced as an industry and as a hobby. The horticulture industry is responsible for the production of fruits, vegetables, and ornamentals for local and export market. Horticulturist in the floral, landscaping and nurseries produce ornamental plants for use in creating attractive surroundings outside or inside the buildings. The horticulture industry is becoming an important sector. The demand for fruits, vegetables, cut flowers and other ornamentals are increasing every year. The estimated market value in this sector can be worth a few billion ringgit. Due to increasing demand for planting materials, horticultural nurseries are mushrooming in every part of the country. From small roadside nursery to large-scale business by the corporate sector, the horticultural industry is expanding fast. Interest in agro-tourism and agro-hobby are steadily increasing. So, the demand for fruits and other horticultural plants is expected to increase. Irrigation is one of the most important operation in a commercial nursery. For plants grown in polybags, irrigation need to be done on a daily basis. Irrigation is time consuming and requires skilled labour. Automatic irrigation and fertigation system will improve irrigation efficiency and plant quality apart from reduced labour cost.

Materials and Methods

Automated irrigation system is being developed at UPM using imported components. A 6-station controller with solenoid valve is being evaluated for irrigation of fruit seedlings grown in ceramic pots. Micro-sprayers, perforated hose, and mini sprinklers are being evaluated for their performances. Battery –operated valves are also being evaluated for application in areas with sufficient pressure from the main line. Information on irrigation water requirements for nursery is important in the design and selection of sprinkler or emitter spacing and discharge. Different size plants will require different volume of water to meet the evapotranspiration. For irrigating plants grown in containers, point source emitters, microsprayers, or perforated hose can be used. Battery operated valves were installed to irrigate fruit seedlings grown in polybags. A 6-station controller was set up to irrigate fruit seedlings grown in ceramic pots. Only three lateral lines were set-up to irrigate pulasan, water-apple, and longan seedling. Battery operated valves were also used where the mainline water pressure is high. A Netafim fertilizer injector was also added to the irrigation system for the application of soluble fertilizers using an open and a closed looped lateral pipe.

Results and Discussion

Results from the water balance study showed that the average evapotranspiration rate for the fruit seedlings is about 4.0mm per day. The system was operating successfully, provided there is no power failure. The only problem is that sometimes the solenoid valves do not closed fully when actuated to do so. This result in over-irrigation for that lateral line. Based on the moisture characteristic of the soil used, the system was program to operate once a day every for the peak water demand period of June through August. The battery-operated valves were installed at a commercial nursery. The programmable valves have been working successfully for the past two years. The only precaution that has to be taken is to protect the battery-operated valve from rainfall. The other problem that can happen is clogging of the valve due to lack of good filtration system. Results from the fertilizer injection system show that fertilizer distribution for the closed looped system are more uniformly distributed than the open loop.

Conclusions

A 6-station programmable controller with solenoid valves was set up at UPM for automated irrigation of fruit seedlings grown in ceramic pots. The system was set up to irrigate only a small number of plants but can be expanded to operate more stations. From initial water balance study, the average evapotranspiration for the fruit seedlings grown in large ceramic pots is about 4.0mm per day. This system can be used for irrigation of larger nurseries. For smaller nurseries

with available water supply from the main, battery-operated programmable valves are recommended. Although several fertilizer rates were tested, injection rate of 80 l/hr and 100 l/hr are recommended.

Benefits from the study

Horticulture nursery operators can benefits from this study because crop water requirements, choice of controllers and solenoid valve can be made so as to optimize the use of limited water supply

Patent(s), if applicable:

Nil

Stage of Commercialization, if applicable:

Nil

Project Publications in Refereed Journals:

Nil

1. M.S.M. Amin, M.H. Faruqui, **A.A. Zakaria** and F. Abdullah. **2000.** Microsprinkler Discharge Uniformity Evaluation. **PERTANIKA Journal of Science and Technology**

2. M.S.M. Amin, **A.A. Zakaria** and S. Sukiman. **2000.** Microsprinkler Discharge Uniformity Evaluation. **PERTANIKA Journal of Science and Technology**

Project Publications in Conference Proceedings

A.A. Zakaria. 2000. *Rainfed Agriculture and Clever Use of Water Resources in Malaysia.* Proceedings of the 12th Asian Agriculture Symposium 2000, **Khon Kaen, Thailand.**

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