

# Chapter 15

## WSN, APSim, and Communication Model–Based Irrigation Optimization for Horticulture Crops in Real Time

**Balakrishna K.**

*Maharaja Institute of Technology, Mysore, India*

### ABSTRACT

*The use of wireless sensor networks, the internet of things, and advanced technologies lead to new direction of research in the agriculture domain called prescriptive agriculture. Prescriptive agriculture is the enforcement of precision agriculture, which is observing, measuring, and responding to inter and intra field variability of farm field. In this chapter, the advent of wireless sensor network, APSim, and communication model spurred a new direction in the farming domain at optimizing irrigation. Sensors are programmed to collect the datasets of climatic parameters such as relative humidity and temperature, where the datasets were forwarded to the server through a GSM module. Datasets collected were analyzed through statistical software for grown crops by considering inter and intra farm field conditions. Finally, information on irrigation is decimated through an algorithm designed by way2SMS and WebHost server.*

### INTRODUCTION

About 70% of all freshwater is utilized for landscape irrigation in farming around the world. Water plays a critical role in farming in nearly all aspects of determining the productivity of the crop. Even the good seeds and applying sufficient fertilizers fail to achieve their full potential if the plants are not optimally irrigated. Day by day water scarcity rapidly increasing due to a decline in the rainfall and food demand increasing for the consumption of the vast population. Present-day developing requests raising benefit per unit of land to fulfill staple enthusiasm to a tremendous people within lessened developing area zone. Towards accomplishing this objective, ranchers go with the tried and true way of thinking arrangements like trickle water system, satisfactory utilization of preparation, crop design, and so on.

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The development phases of a plant rely upon different variables like ecological conditions, soil quality, and other related boundaries. Water causes the plant to be new, yet also plant's tissue cell assumes a significant function through the assimilation of supplements and photosynthesis (Balakrishna K., and Rao, M. (2019)). The water system is the strategy for applying water remotely to the enhancement of the prerequisite to plants; eventually, plants get water from the sources like raining, dampness content in the air and soil. The satisfactory utilization of the water system helps in the presentation of harvests legitimately as well as by implication by affecting the accessibility of different supplements in taking, the circumstance of the social activity, and so on.

Wireless sensor innovation prodded another heading for the progression of the cultivating through the advanced technology. WSN (Wireless Sensor Network) alludes to spatially dispersed remote organization gadgets that utilization the sensor to screen the physical climate boundaries continuously (Balakrishna K. et al. (2018)). Innovation and arrangements are being applied in this domain to give an ideal choice to accumulate and deal with data to advance the water system through factual programming (Balakrishna K. (2020)). Besides, alarming environmental change and shortage of water demand better than ever techniques for present-day cultivating. APSim is measurable programming, which makes a social model for the inter and intra field inconstancy of the farm fields. Precision Agriculture is one of the encouraging areas in perceiving, estimating and reacting to inter and intra field changeability through a wireless network. A key segment of the precision farming methodology is the utilization of data innovation through a wide cluster of parts, for example, sensors, GSM module, computerized equipment, and programming. Enforcement of exactness precision agriculture choices progressively prompts another space called prescriptive horticulture.

Prescriptive Agriculture is a point by point, site-explicit proposal and understanding to assist ranchers with expanding their yield from the streamlining inputs. This technology captures huge amount of datasets from the farm fields and analyze the datasets based on the plant's condition and helps rancher's in decision making for the management of crops. It influences the site-specific for the ranchers at increasing yields and reducing inputs. Numerical based decision making for the irrigation for artificial intelligence-based for water system is achieved through factual programming software APSim software (Mare Srbinovska et al. 2014). In this paper, another methodology is proposed for the improvement of the water system for cultivation crops dependent on WSN, measurable programming and present-day innovation.

## **LITERATURE SURVEY**

To analyze the work of state-of-art, here discussed relevant work done so far in the improvement of the irrigation system for the selected horticulture crops using advanced technologies.

Balakrishna K (2020) worked on optimizing irrigation for horticulture crops like Okra, Tomato, Bell pepper, Cucumber, and Cabbage. The author programmed a WSN device to gather the temperature and relative humidity of the rancher field for a determinate interval of 6 hours for nearly 50 days from 50 devices, which are deployed within a distance of 300-400 meters. Statistical based software like APSim model designed to optimize the irrigation for the selected crops considering the soil inter and intra variability of the farm fields. The mathematical simulated model shows that around 80 – 90% of water can be saved compared to drip irrigation.

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