

# ROLE OF SMART PHONES IN IRRIGATION MANAGEMENT

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## INTRODUCTION:

Sustainable irrigation management requires reliable and easy-to-use methods and tools to support real-time scheduling with respect to the availability of water, specific soil and weather conditions, a crop's water requirements, and a crop's response to stress. Studies, conducted in recent years in various parts of the world, have shown that the use of innovative technologies, management approaches and modeling tools can improve irrigation scheduling, save water, enhance a farmer's income, and reduce the environmental burden. In this context, real-time automatized irrigation scheduling, based on reliable low-cost sensors and simple water balance models, is receiving a growing amount of attention.

Electronic communication that offers more flexibility and is more easily accessible is the smartphone/device app. The functionality of an app differs from a web tool, as apps are with the user at all times (via a smartphone) and readily accessible, and apps engage the user through notifications. Notifications, similar to text messages, prompt users to respond to critical events. Thus, notifications can be designed to achieve particular actions by the users. Furthermore, apps provide an ideal medium for irrigation scheduling because of the need for continual, repeated use, and accessibility in field settings. The growing use of smart phones and availability of weather data has resulted in an ideal situation for designing and implementing smart phone apps for irrigation scheduling. Using this concept, several Smart Irrigation apps were developed.

## SMART PHONE APPS FOR DIFFERENT CROPS:

Smartphone apps are available in the respective app stores. In developing the apps, special or unique features were added based on input from clientele groups. These features helped to improve the user experience. The ultimate goal of the apps is their use by irrigators such that water is applied using a science-based method, resulting in water conservation with no yield reduction or plant damage. Thus, the apps include notifications that are sent to promote irrigation scheduling changes that reflect plant water needs on a real-time basis.

### 1. COTTON APP

The cotton app provides a water deficit scale that is generated from a water balance (fig. 1). A unique feature of this app is the ability to input irrigation applied and rainfall received to more accurately tabulate an irrigation balance. The use of a deficit scale for irrigation also allows users to decide the level of the deficit they prefer before initiating irrigation.

### 2. VEGETABLE

The vegetable app is the only Smart Irrigation app that includes multiple crops: cabbage, squash, tomato, and watermelon. Multiple crops were included due to their similar irrigation systems (i.e., drip irrigation) and seasonal planting schedules. In addition, many producers grow more than one type of vegetable, and thus they can access all irrigation scheduling tools with this one app.

In Florida, most vegetable crops are cultivated on sandy soils with low soil water retention capacity, which requires multiple irrigation events per day



Figure 1. Screenshot of the SmartIrrigation Cotton App indicating how users can view data from multiple fields or zones as well as from up to nine previous days. The root zone soil water deficit is displayed both graphically and numerically in the center of the screen.

to minimize soil water percolation and nutrient leaching. With the selection of maximum duration of the irrigation event, the app indicates when the irrigation should be split into smaller applications instead of a single event. Figure 2 shows example information provided by the app for tomato, which includes the irrigation schedule and accumulated degree days.

## BLULEAF®:

Bluleaf® is a smartphone-based Decision Support System (DSS) (developed by Sysman Progetti & Servizi, Mesagne, BR, Bari, Italy) designed to provide integrated support to farmers, including, under a common shell, weather data (historical, real-time, and forecasted) and management tools for irrigation and nutrient application and plant disease risk-alert and protection. The system integrates scientific achievements and technological innovations in the fields of irrigation, agronomy, weather, and soil moisture sensors, and data acquisition, transmission, and management and the application of web and app tools in agriculture. The irrigation component uses weather, soil, crop, and irrigation system data to estimate water balance components during the crop-growing cycle and to elaborate irrigation scheduling.

## WATERBEE:

WaterBee consists of a series of sensors that measure soil water content (or potential), environmental parameters that influence evapotranspiration, and indicators of crop development or physiological status. The data gathered from these sensors is

sent across a low cost, low power consumption ZigBee wireless sensor network. These sensors are effectively distributed over the cultivated area, given that different areas of the field (or fields) have different water requirements. The sensors monitor these parameters and send readings across a Zigbee mesh network to a GPRS gateway which sends all of this data to a central web service that uses an intelligent software application to automatically analyze the data and act upon it by selectively activating irrigation nodes only in the areas required. This data is fed into an intelligent software package that uses intelligent agents in order to act upon the information they are receiving from the sensors. The outputs and irrigation recommendations are presented to the user on a Smartphone App or Web Browser." - Waterbee.

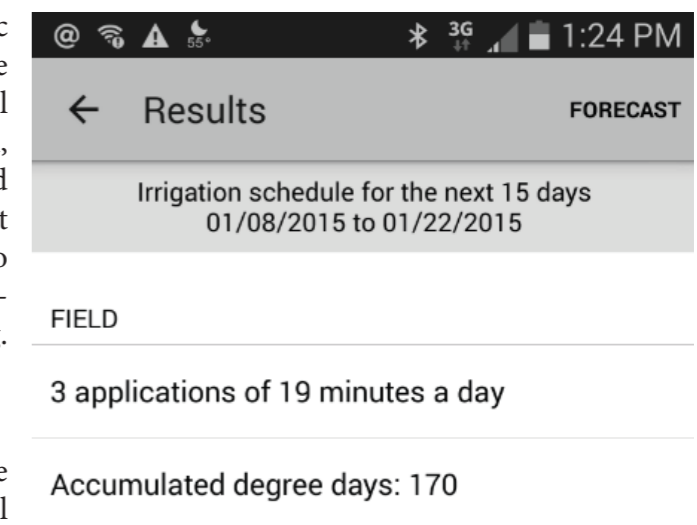


Figure 2. Screenshot of vegetable app output for tomato.

## EVAPO:

EVAPO is a smart phone app developed for android smart phones for real-time estimation of the potential evapotranspiration worldwide using climate gridded data from NASA-POWER. EVAPO is the state-of-the-art app applied in agricultural or hydrological problems. EVAPO is an app ready-to-use in practical situations where there is a scarcity of water. EVAPO app is reliable because uses Penman-Monteith method to estimate potential evapotranspiration worldwide.

## NANO GANESH:

Nano Ganesh is an irrigation automation system from Indian company that allows farmers to use mobile phones to remotely control the irrigation pumps located in distant hazardous locations. It is a hardware device attached to the existing starter and water pump set. The application was developed by Ossian Agro Automation in Pune, India, initially with external basic mobile phones used for wireless connectivity and later on with built-in GSM modules named as Nano Ganesh GSM. The overall developments of various wireless remote controllers began in 1996 by Santosh Ostwal, an Electrical Engineer, the founder of Ossian and son of a farmer. Approximately 60,000

farmers in India have been using Nano Ganesh since 2008 till 2017.

## BEST SMART IRRIGATION SYSTEMS IN 2020

### Rachio 3:

The Rachio 3 is the best smart sprinkler controller. It connects to either your 2.4GHz or 5GHz Wi-Fi network and is certified to work with Alexa. Just download the app and away you go on iPhone or Android. It's so smart, it even uses satellite information to skip programmed times based on rain and wind data.

### Green IQ Smart garden hub:

While doing an excellent job as a smart irrigation controller, the Green IQ hub can be expanded to control soil water sensors, garden lighting, and more, all from the easy-to-use app (available for both iOS and Android).

### Netro smart sprinkler controller:

The best thing Netro has going for it is its app, which has a simple, minimalist interface that's perfect for helping even newbies understand watering schedules and other information related to irrigation. The controller itself is also inconspicuous as it automatically adjusts our watering schedule based on weather information and even local water alerts and restrictions.

### Hydrawise hunter:

Hydrawise's controller gives detailed reports in its elegant app, showing water usage, rainfall amount, and even alerting to broken pipes and spray heads, as well as faulty wiring and valves.

### BlueSpray smart sprinkler controller:

BlueSpray is a bit old-school in its approach since it uses a web-based app rather than a mobile one. It gives a full picture of property using Google Maps information (or your own photo), letting you drag and drop commands. It supports rain, flow, moisture,

and door sensors, and it can be programmed to comply with any water restrictions.

## CONCLUSION:

The rapid incorporation of smart phones into the daily lives of individuals has opened new avenues for data delivery. As the access to smart phone technology increases, dispersal of precise irrigation scheduling methods may also increase. Using real-time weather data to schedule irrigation is not a new concept; however, previously, it would have involved directly downloading data from a weather station or, more recently, accessing data from the Internet-based site and entering it into a fairly complicated equation to develop irrigation recommendations. This process was generally too time-consuming for growers who may be managing dozens if not hundreds of irrigation zones. By linking to nearby weather stations and generating automated recommendations that are sent directly to a smart phone in the field, these new Smart Irrigation applications bypass the cumbersome data transfer and calculations previously required for scheduling irrigation.

