MEDWIN PUBLISHERS
Committed to create value for Researchers

Open Access Journal of Agricultural Research
ISSN: 2474-8846

Sensor Based Irrigation System for Improving Water Productivity: A Critical Need for Adaption in Pakistan

Arshad A*

Department of Irrigation and Drainage, University of Agriculture, Faisalabad, Pakistan

***Corresponding author:** Arfan Arshad, Department of Irrigation and Drainage, University of Agriculture, Faculty of Agriculture Engineering and Technology, Faisalabad, Pakistan, Email: arfanarshad52@gmail.com

Editorial

Volume 3 Issue 2

Received Date: May 07, 2018

Published Date: May 11, 2018

Editorial

Irrigation plays an important role in production of agriculture. However, with the passage of time shortage in water resources is affecting agriculture productivity adversely [1]. Increasing water shortage has led to put pressure on agricultural engineers to apply water more efficiently for irrigation in order to improve water productivity [2]. Today, the major research direction of the world's agricultural engineer is to sustain water resources. Therefore, efficient water management becomes very crucial in most of the cropping systems, specifically in semiarid and arid areas like Pakistan. The climate of world is changing rapidly and it has been observed since the 20th century, variability of climatic parameters have led to change across worldwide precipitation scenario, thereby disturbing natural water cycle [3-5]. Greenhouse gases emitted from anthropogenic activities have resulted in warming of climate (Source: Meinshausen et al., 2009). IPCC reported that, during 1850-1900 increase in land surface temperature was 0.8^{o}C, but after that it will reached up to 1.5^{o}C increase from 1900–2100, which may disturb water balance and Eco-hydrological parameters [6]. The farmer is unaware of these changing and using the conventional irrigation system resulting into the loss of crop yield but also the loss of precious irrigation water resources. To overcome this situation there is an important need to apply water to crops according to their need. For effective water management, real time estimation of irrigation has a great importance and all irrigation organization requires updated information related to crops sown within study area and also the data on water utilized by crops. But unfortunately this is a difficult task to collect data because these irrigation schemes cover large area, sometime thousands of square mile and have large number of forms that's why they don't get data effectively as needed. GIS and remote sensing is a powerful tool for land use and crop identification when used with satellite imagery [7].

Although the drip irrigation system, center pivot and sprinkler irrigation system are being used; however, there is always a great variability in soil properties throughout the field. These systems does not take into account climatic variability, soil moisture variability and crop phenology. In general, precision agriculture (PA) assumes that agricultural fields are not uniform and displays substantaial spatial variability in their properties. This non-uniformity depends on soil properties, needs of fertilizer as well as agricultural practices and their management. When water is applied uniformly to a field, some areas of the field may be over irrigated while other areas may remain too dry. So there is a need of time to integrate the sprinkler irrigation system with variable rate and sensing devices which could capture the variability in field properties. Variable Rate Irrigation (VRI) is an innovative technology that enables a center pivot irrigation system to optimize irrigation application based on the individual management zones within a field Evans and King, [8]. Distributed in-field wireless sensors and satellite based irrigation management system possess the ability to improve water productivity. The famer will be able to have real time data availability about soil moisture contents, soil temperature, air speed, air temperature, crop stress level, and crop yield monitoring and crop yield estimation. These all make a decision making system [9].

Availability of differential global positioning system (DGPS), geographical information system (GIS), sensors (ultrasonic, digital photography, EMI, remote sensing, yield monitors and variable rate applicators) and control system, etc. has provided innovative techniques to capture and quantify spatial changes which can help in implementing variable rate applications. The hardware and software of the Precision agriculture systems are connected to the applicators using computer programming, electromechanical design, electronic actuators, and digital communications techniques for real-time decision making to improve profitability and environmental sustainability. Additionally, Precision agriculture systems coupled with a Differential Global Positioning System are capable of acquiring high spatial resolution data which can allow us to identify the factors affecting efficiency in spatially variable fields. This letter suggested that, an intelligent, novel, automated and remote sensing based real time sprinkler irrigation system could be domesticated in Pakistan to minimize the consumption of water and to improve the productivity of cereal crops.

Needs in Pakistan

Irrigation system of some developing countries like Pakistan, is supply based when hydrological inputs (water) is being applied with constant rate which could be over irrigated for some areas and some areas left dry. Moreover almost all area is irrigated with flood irrigation which not only deplete future water resources but also decrease yield in some areas. Most of agriculture areas in Pakistan have been saline due to flood irrigation system. The conventional farming trends cause a huge water loss and environmental degradation, and ultimately farmers get low profit. So judicious use of water and agricultural inputs is the dire need of the time in Pakistan. Development of more efficient system is essential to reduce water consumption and to increase agricultural production. Remote sensing based real time water applicator could help in minimization of hydrological inputs in these areas to sustain the environment. Adaption of remote sensing based irrigation system will have a great importance to improve the water productivity of cereal crops by using less input (water) to get more yields at optimized level.

References

1. Sax D (2000) The shortage of water resources in 21 century. Express Water Resources & Hydropower Information 21(8): 1-5

2. Adamala S, Raghuwanshi NS, Mishra A, Tiwari MK (2014) Evapotranspiration modeling using secondorder neural networks. Journal of Hydrologic Engineering 19(6): 1131-1140.

3. Wang R, Kalin L, Kuang W, Tian H (2014) Individual and combined effects of land use/cover and climate change on Wolf Bay watershed streamflow in southern Alabama. Hydrol Process 28(22): 5530-5546.

4. IPCC (2007) he physical science basis, in: Contribution of working group I to the fourth assessment report of the intergovernmental panel on climate change.

5. Murray SJ, Foster PN, Prentice IC (2012).

6. Han S, Tang Q, Xu D, Wang S (2014) Irrigation-induced changes in potential evaporation: more attention is needed. Hydrological Processes 28(4): 2717-2720.

7. Gontia NK, Tiwari KN (2010) Estimation of crop coefficient and evapotranspiration of wheat (Triticum aestivum) in an irrigation command using remote Sensing and GIS. Water Resource management 24(7): 1399-1414.

8. McCarthy AC, Hancock NH, Raine SR (2014) Simulation of irrigation control strategies for cotton using model predictive control within the VARIwise simulation framework. Computers and Electronics in Agriculture 101: 135-147.

9. Evans GW, Harting GB (1999) Precision irrigation with center pivot systems on potatoes. In: Proceedings of ASCE 1999 International Water Resources Engineering Conference, August 8-11, Seattle, WA.