Chapter 9
Smart Irrigation Techniques for Water Resource Management

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ABSTRACT

Rising temperatures and increased frequency of extreme events will have direct and negative impacts on natural resources. Water resources are limited on earth; hence, there is a need to manage the utilization techniques of water. The irrigation system improvement using the wireless network is a solution to accomplish water conservation goal as well as improvement in irrigation practices. Smart farming enhances the capacity of the agricultural systems to support food security. The need for adaptation and the potential for mitigation into sustainable agriculture development strategies can be incorporated into such system. The smart farming system includes different techniques of agricultural practices to conserve different resources including water. Solar powered smart irrigation systems are a part of the smart irrigation system. Smart irrigation system includes temperature, moisture, and humidity sensors system. Different smart irrigation systems which are used all over the world will be discussed in this chapter.

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BACKGROUND

The first canal built appears to have been named the Exefer Canal in post Roman Britain, opened in 1563. In Russia, the Volga-Baltic Water ways was opened in 1718. The archaeological evidence of irrigation in farming first found about 6th millennium B.C. in the Middle East’s Jordan Valley (Hillel, 1994). In Peru, archaeologists found remains of three irrigation canals and after radiocarbon dating it was found that these are dated the 4th millennium BCE. These canals are the earliest record of irrigation in the New World (Dillehay, 2005). In the middle of 20th century, the invention and introduction of diesel & electric motors led for the first time to irrigation system that could pump groundwater out of major aquifers faster than it was recharged. Sophisticated irrigation & storage systems were developed, including the reservoirs built at Girnar in 3000 BCE (Rodda, J.C 2004). In America and Oceania, the area equipped for irrigation was 15% and 1% in 2003 & 18% and 0.9% in 1980 respectively (Sieberta et al., 2006). At present, India has the highest irrigated area in the world today with almost 57 Mha (1/5th of world’s net irrigated area (Singh, 1997).

INTRODUCTION

Water scarcity already affects every continent. Around 1/5th of the world’s population live in areas of physical scarcity, and almost one-quarter of the world’s population, face economic water shortage (CWAC, 2014). Agriculture is the backbone of the economic base of each country of the world. The daily need for food shows the importance of agricultural development. Food and agriculture are the largest consumers of water, requiring one hundred times more than we use for personal needs. One of the main challenges in agricultural activities is irrigation. As the global climate decreases the source of water throughout the world, it is necessary to take steps for preserving it. The extent of irrigated land has more than doubled, increasing from 139 to 301 million hectares between 1961 and 2009 (FAO, 2011a). However traditional irrigation management is done by the people itself. It requires the presence and continuous monitoring of irrigation by the farmers in the field area. An early canal irrigation system had also found in The Indus Valley civilization in Pakistan & North India (from 2600 BCE). Large-scale agriculture was used for the purpose of irrigation. Sophisticated irrigation & storage systems were developed, including the reservoirs built at Girnar in 3000 BCE (Rodda and Ubertini, 2004). Soil moisture is the primary required information in achieving optimum water requirements for the crops (Schroder, 2006). In 2001, agricultural uses accounted for about 5%, 10%, and 17% of the internal renewable water resources of Africa, the Caribbean, and Asia, respectively. Asia has the largest proportion of global
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