WIRELESS SENSOR NETWORKS: STATE OF THE ART AND FUTURE PERSPECTIVE

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Abstract

To reduce labour cost the span of control of first line personnel- and production managers is increasing; fewer managers oversee more personnel and more production area. This makes the decision making process more complex and the need for more information from the greenhouse work floor is increasing. Contrary to this the production systems in greenhouses are monitored and managed at a smaller scale. There is an increasing amount of information coming from those smaller individual sub-systems. To gather this information, Wireless Sensor Networks (WSN) are beginning to play an important role.

In a greenhouse a WSN may consist of a network of several nodes which communicate with each other by radio. A node has several microprocessors which can handle small programs that manage the incoming and outgoing radio messages. Each node is connected to one or more sensors (temperature, relative humidity, light etc.). The measured data is sent via the node network by radio to a base station connected to a PC for storage. The electronics and software that make up the node are designed with low power consumption in mind. Usually the nodes are battery fed and the radio transmitter power is low to increase battery life. Sensor information can be sent over 100 to 1000 meters depending on the radio bandwidth used. If the distance between a node and the base station exceeds this distance, then an intermediate node will act as a relay node. This is called hopping. The US military started the technical development of WSN in the early 90's. Recently WSN came on the industrial market. WSN is for example used to monitor temperature in art galleries and warehouses etc. A few years ago, WSN entered the agricultural and horticultural domain. Advantages of WSN over wired sensor systems are: the low installation costs, flexibility and mobility and the possibility to use for distributed computing. This paper presents a survey of

the state of the art of WSN. Technical requirements for use of WSN in greenhouse crop production will be discussed. So far, WSN has been used in two research projects of Wageningen UR Greenhouse Horticulture. The first is a project that investigates the risks of Botrytis on Gerbera flowers by monitoring the temperature and humidity within the crop via a WSN. In a second project, a WSN with 100 nodes is used to measure spatial temperature and humidity differences as a possible cause for yield and quality differences in different crops. Preliminary results of a working WSN will be presented. In the future the results of this paper will be used as a guide line to build up a WSN suited for the demands and requirements from greenhouse practices.