

## Uses of Sensor and IoT in Protected Cultivation

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### Abstract

Agriculture plays a vital role since the beginning of the civilization. Updating the techniques and technologies associated with agriculture has been a challenge to the human kind. It has been a continuous effort to grow seasonal crops during off-season, non-native crops, keep the track of crop status and automate the process. Today the IoT has enabled us to achieve the same to some extent. The use of various advanced networks, sophisticated sensor systems and complex networks has made it possible to reach to this stage. This article revolves around the various tools and interfaces used to reach this stage of success in cultivation. The various networks and communication protocols like LoRaWAN, WiMAX, ZigBEE, etc., and MQTT, DDS, CoAP, etc., respectively have contributed a lot to making this effort of the research community a success. Sensors like optical sensors, electrochemical sensors, electromechanical Sensors are used to monitor various environmental & physical parameters and provide corresponding electrical equivalent to utilize the information in the process of monitoring and control. The IoT enables the sensor and network to communicate and act together to operate corresponding actuators to meet the desired levels that suits the crop growth.

**Keywords:** IoT, LoRaWAN, WiMAX, sensors, agriculture, polyhouse

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### 1. Introduction

India's population is increasing day by day and there is pressure on the Agriculture sector on Food production. Due to the Green revolution, food production in India is also increased. We see all are directly or indirectly dependent on Agriculture Sector in terms of Food and Employment. Now the advancement of electronics capability in wireless technology plays a variety of roles in the agricultural sector. The problem associated with agriculture and food is crop production, soil fertility, water management (Mason *et al.* 2019; Canales-Ide *et al.* 2019; Abrahamsen *et*