A Detailed Survey on Improved Groundnut Harvest Automation System Using Wireless Sensor Network Technologies

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Abstract

This paper analyses the wireless sensor network technologies on how to use in agricultural crop harvesting and highly productive yielding applications. Wireless sensor networks (WSN) monitoring the crop growth ubiquitous manner and sending crop growth report to the agricultural university administrator system. This survey paper makes a comparison between wealthy crop growth databases to actual crop cultivation reports. The main objective and motivation of this survey paper are tremendous changes are needed in the field of agriculture. Finally, they will give well-optimized suggestion to the farmers such that fertilizer recommendations, managing and controlling crop diseases, suitable irrigation system for crop cultivation, which is all the methodologies are helping to improve the yield of crops.

Keywords: Wireless Sensor Network, GPS, IOT, WAGRIT, GCS Optimization.

1. Introduction

Indian people’s culture, civilization, tradition depends upon agriculture. Mahathma Gandhiji says India’s backbone as villages. Villages are dependent upon agriculture. But nowadays agriculture is demolished, due to lack of reasons such as unreliable weather conditions, soil composition, and PH stages are unstable, sudden changes in rainfall, uncontrolled crop diseases, cost of sowing, cost of fertilizers, cost of insecticides and cost of irrigation system. According to these reasons, agriculture is not a good growth business. A farmer faces a lot of difficulties in agriculture. These difficulties deeply affect the farmer’s life. Crop cultivation is not fulfilling the former basic needs also because of these reasons they are all made to attempt suicide. In this situation definitely could be changing.

The main contribution of this paper deals with the growth monitoring system of groundnut. This system proposes a monitoring environment of the groundnut field. For example groundnut sowing soil PH level, root depth, chlorophyll content, Fertilizer recommendation, irrigation monitoring, sunlight luminance, humidity, temperature, EC, wind direction, wind speed, and so on. These are all monitoring information to be stored in a groundnut database.

The proposed system helps to improve and better yield to groundnut agriculture. Suppose the farmer is uneducated, the system advises the farmer to make appropriate decisions in an appropriate time. In other words, the former has unawareness about groundnut diseases and the stages of the disease finally what insecticides use to control the diseases. Now a day the information management and communication technologies become a new era. But these technologies not yet to addressed in the agricultural domain. This paper addressed this problem the new innovative wireless sensor technologies used for urban area agricultural development.

In this existing system too complicated construction of ubiquitous monitoring, it means continuous monitoring of a crop any time and every time the field report sends to the agricultural university database and make prevent take a location-aware decision to the farmers. The ubiquitous technology of wireless sensor networks requires platforms of internet information services (IIS) and applications of the internet of things (IoT). The survey report is light the lamp to farmer’s life and food cultivation is also a basic need of human beings. Information management and communication technologies used in high yield productivity of groundnut.
Suspendisse dapibus [The prior in technology allows the Wireless Sensor Networks (WSNs) for monitoring, analysis, and decision making in a variety of areas like agriculture, military, medical, environmental, and industrial fields. WSN provides an important technology for large-scale monitoring along with providing sensor measured data at high temporal and spatial resolution. The simplest applications are a sample and send where measurements are relayed to base stations. In the agriculture monitoring system, WSN collects environmental and soil information, this might be regulated even at a remote site.

2. Wireless Sensor Technologies

Recently, the use of WSNs in precision agriculture has attracted much attention. The figure 1.1 describes an existing model for high yield prediction process. WSN for precision agriculture involves the deployment of sensor nodes in a field and then capture data like temperature, soil moisture, and others. These data are then sent to a base station where necessary decisions are taken. Precision agriculture concentrates on providing the means for observing, assessing, and controlling agricultural practices. The goal is to have better management of resources and better crop yield. In this section, a recent model on WSNs for precision agriculture are surveyed and analyzed.

3. Groundnut Cultivation

Groundnut is purely growing on partially loam clay soil. Sandy loam soil is prescribed for groundnut cultivation. Drained loam soil is also suitable for groundnut cultivation. The pH range is 6.5–7.0 soil is well-defined soil for groundnut cultivation. The well-defined temperature for groundnut cultivation is 18°C (Tamil Nadu Agricultural University to recommend a soil test for before groundnut cultivation).

3.1 Groundnut Cultivation Preparation

Now a day the new technology drip irrigation is suitable for groundnut cultivation. The advantage of a drip irrigation system is to reduce the amount of water wastage. The drip irrigation system is also a consumable farmer’s price up to 8000 to 10000 per acre. Normally the groundnut growing period is 130 – 140 days in the growing season. Especially groundnut is sowing in the Tamil month of vaikasi (June - July) season in Tamil Nadu, India. Totally 20 water cycles of furrow irrigation period are enough to cultivate groundnut.

Figure 1. WSN Monitoring System for Groundnut Cultivation Model
3.2 Fertilizer Recommendation
In an existing model recommendation to fertilizer soil test for before groundnut cultivation and if that results appeared 1.3 ppm of (Parts per million concentration of fertilizer) of zinc 25 Kg of ZNSO4 Zinc Sulphate is added to our land soil. Suppose Zinc Sulphate concentration is high you have to add an equal ratio of Nitrogen, Phosphorus, and Potassium (10:10:10). In the third category low percentage ie 39.4ppm, you have to spray 0.5% of Zinc Sulphate is to be prescribed.

3.3 Deficiency of Leaf Identification
Various minerals and vitamin deficiency identified using agricultural university groundnut cultivation database.

3.4 Iron Deficiency (ID)
Figure 2 is identified by the yellowing of the top part of the leaf. The midrib of the leaf veins is green but leaves are yellow (Chlorosis). After a few days, the leaf totally left the chlorophyll content. So it could not involve in photosynthesis. It is identified by the yellowing of the top part of the leaves.

![Figure 2. Iron Deficiency Leaf](image)

The midrib of the leaf veins is green but leaves are yellow (Chlorosis). After a few days, the leaf totally left the chlorophyll content. So it could not involve in photosynthesis. Finally, the crop will be dead.

3.5 Boron deficiency
Figure 3 is identified from most of the groundnut growing areas in India. Boron deficiency is due to occur on deeply weathered soil. The inner color of the groundnut seed is black. These deficiencies affect the quality of the seed and to overcome the Boron deficiency to apply Borax 10Kg with 400 Kg/ha in 45 days of sowing.

![Figure 3. Boron deficiency groundnut](image)

4. Pests monitoring system
In this section, we review the current trends in the use of WSN's across the subject of pest monitoring and control. Pest detection and control is at least as old as agriculture because there has always been a need to keep crops free from pests. A number of techniques so far proposed for pest control in agriculture using wireless sensor network. In this part of the paper we will review and present different types of proposed mechanisms and techniques and analyze the research work of different authors and compare the relative pros and cons.
4.1 Pest Monitoring and Yield improvement

4.1.1 Aphis Craccivora

Figure 4 is the main pests of groundnut. It has soft bodied with black wings. It freshly attacks groundnuts especially in winter seasons. Nymphs and adults suck the underside of the leaves. These leaves are yellow colour. These pests totally affect the yield of groundnut.

![Figure 4. Aphis Craccivora](image)

To control the Aphis Craccivora use Neem cake diluted or dissolved water of Neem powder to be spread to the groundnut weekly twice, continue these controlling technique regularly four times.

4.1.2. Amsacta albistriga

Fig 3.3 is also one of the main destroyed pest groundnut crop in rainfall days. The pests’ entire part of the groundnut crop could be eaten. To control the Amsacta albistriga collect and destroyed after ploughing.

![Figure 5. Amsacta Albistriga](image)

5. Proposed system wireless sensor technology model

The wireless sensor networks combined working feasibility with Mobile Ad-hoc networks. Recent technologies in wireless sensor networks use low power, low cost, multi-functionality specifications, and communication distance also conciseness. The main advantage of wireless sensor networks is self-localization capacity.

Inside of wireless sensor networks (WSN), a large number of sensor nodes operate and surveillance in an uncertain environment also. WSN’s communication technologies use radio frequencies for communication to microwave and millimeter waves. The reason WSN with Ad-Hoc network for using this type of wave yields omni-directional links that are not unidirectional, so the sight should be monitored in all directions.
5.1 WSN Hardware
Platforms can be classified into three main categories. Personal computers for general purpose, System on Chip (SOC) sensor nodes, dedicated sensor nodes. Personal computers for general purpose it uses Windows, Linux or real time operating system platforms. In this category of hardware equipments used in personal digital assistants. System on Chip (SOC) sensor nodes this type of classification uses BWRC Pico nodes, based on Micro Electro Mechanical Systems (MEMS) low power consumption and high communication and computation capacity. Dedicated sensor nodes are UCLA & MIT μAMP category with simple sensor interfaces and low power consumption. These type sensors are highly recommended for agricultural monitoring purpose ie, groundnut improved harvest automation.

5.2 WSN Software
Platform mainly the operating system provides services to the application; especially task scheduling, memory allocation, system library management, file management, and data transfer. The main task is sequentially function the application without any interrupt and the recent trends of wireless sensor networks supporting all types of operating systems with salient features with a comfortable configuration.

5.3 STANDARDS OF WSN
The Following IEEE Standard is using the monitoring pest system:

IEEE 802.15.4 Standard: By task group, specializes in physical and medium access control layers (MAC) using low power consumption using wireless personal area networks.

The ZigBee standard: The standard developed for the functionalities of the network and application layer. The network layer provides the functionalities of the network at different topologies. The application layer provides a framework for rapid application development. It is a protocol stack developed by Zigbee Alliance

IEEE 1451 Standard: This category of standard belongs to the family of the Smart Transducer Interface. This is an electronic data sheet(TEDS), memory device attached for manufacturer related information, calibration, correction data, measurement range, etc.,

6. System Architecture

![Agricultural Environment Monitoring Server System](image)

Figure 6. Agricultural monitoring system

The soil sensor image information also combines with the latitude, longitude information by the use of the Global Positioning System (GPS). This information collected in real-time with a ubiquitous monitoring environment and converted into a
database. This database compared with the expert database i.e. agricultural university predetermined database. The mismatching ratio should be calculated. For what purpose the groundnut could not able to yield the good production. The reason will be analyzed, whether it is fertilizer recommendation for soil composition, pests infection to be controlled, for high temperature the irrigation system improved and high water supply, etc., These type of suggestions and recommendation ideas provides to the agriculturalist for improved harvest and better yield in groundnut. Figure 6 describes the existing method used WAGRIT (Web-based application for Agricultural and Environment Monitoring) uses separate data collection devices or sensors connected to the server. Network Digital Video Recorder (NDVR) system is capturing real-time field images, based upon these image quality and noise removal process could be also made inside simultaneously. The field information data collected by the physical layer and send it to the application layer for various application purposes.

6.1 Limitations
Wireless Sensor Networks(WSN) combined with environmental sensors to collect agricultural land humidity (Wet or Dryness of the soil), luminance information for photosynthesis of the crop, temperature soil EC and PH values, etc., Every sensor node to form an autonomous network architecture and collected data information send it to the server. Closed Circuit Television (CCTV) system to take real-time images and GPS module collect the location information of the agricultural land and send it to the server. The solar system provides power supply for the entire system module.

7. Conclusion and Future Work
This paper proposed an improved harvest yield of groundnut using wireless sensor network technologies. This system integrates environment and soil sensors which also include closed-circuit television (CCTV), global positioning system (GPS) components. This system widely used for an entire village so the group of users for the same plant cultivation not only groundnut also used rapidly. Use this type of technical application development to improve life sources of farmers. The group for formers yielding better harvesting results in the proposed system architecture. In future the wireless sensor could be used in wildlife animal monitoring, healthcare application used in patient monitoring, military application, and crime analysis situation monitoring using feasibility of cost and depends upon the depth of analysis.

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