

# CLOUD BASED DATA CENTER IN IMPLEMENTING WIRELESS SENSOR NETWORK FOR PRECISION FARMING IN INDIA

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**Abstract:** Wireless Sensor Network has been identified as one of the most important technology in this century. There are sustainable advantages of Wireless Sensor Network (WSN) in agriculture. Even though in India we could not find such implementation because of several reasons: Implementation cost, Farmers unawareness of technology, ignorance of government for this regards.

This paper is to present implementation cost issue in regard with Indian farmer for implementing Wireless Sensor Network in precision farming and its solution.

**Keyword:** Wireless Sensor Network, Precision Farming, Cloud Computing, Data Center.

## I. INTRODUCTION

Wireless Sensor Network (WSN) is an emerging and widely used technology in today's era. Where a WSN is used in many areas such as military, healthcare, tracking, Environmental monitoring, warfare, child education, surveillance, micro-surgery, and agriculture are only a few examples. WSN can be used for Precision Farming for the betterment of farmers and crop production improvement. WSN is already implemented in many developed countries in the world; however, precision farming has been confined to developed countries. Land tenure system, smaller farm size (<1ha) and crop diversity have limited the scope of precision farming in India. Due to smaller farm size Indian farmers prefers traditional farming because of several reasons: Not having enough space for data center management, not been able to cope up with new and upgrading technologies and implementation cost of precision farming. Both the problems can overcome by using cloud based data center at center location (such as Central Big Town or Tahsil or some time at District level.) and used for group of farmers.

## II. WIRELESS SENSOR NETWORK

Wireless Sensor Networks (WSNs) consists of a number of sensors (nodes) spread across a geographical area. Each of these has capabilities to communicate and has sufficient intelligence for signal capturing, processing and networking of the data to the central storage via centralized controller or satellite. The nodes can also forward messages from other nodes, perform network organization tasks, and a variety of other functions.

Sensor nodes are usually distributed in a sensor field as shown in figure1. Each of these distributed nodes has the capabilities to collect data and route data back to the sink and the end users. Data are routed back to

the end user by multi-hop infrastructure less architecture through the sink.

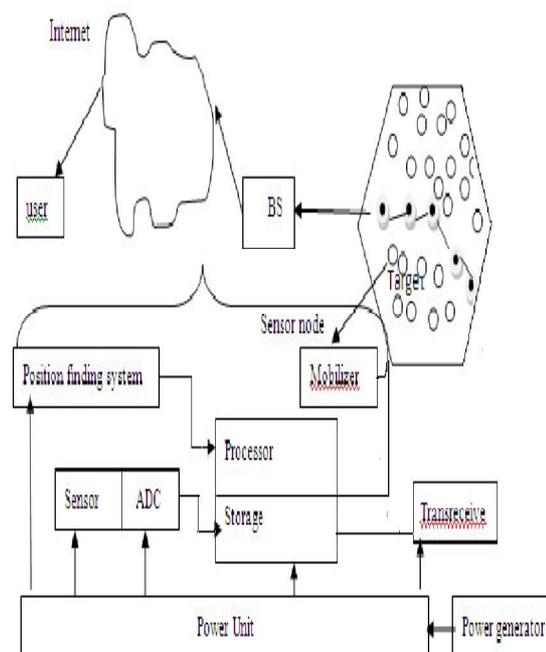


Fig.1 Sensor nodes scattered in a sensor field and components of a sensor node

## III. WSN AND PRECISION FARMING

By using WSN for precision farming one can make powerful and accurate decision on each and every zone of a farm. The sensor nodes need to distribute in the farm field and has to self configure the network and adapt themselves to it.

These sensors can be programmed to record measures like temperature and humidity. All the data are collected from these nodes and end up in a central sink which transfers them to the end user through wireless network, as show in figure 2.

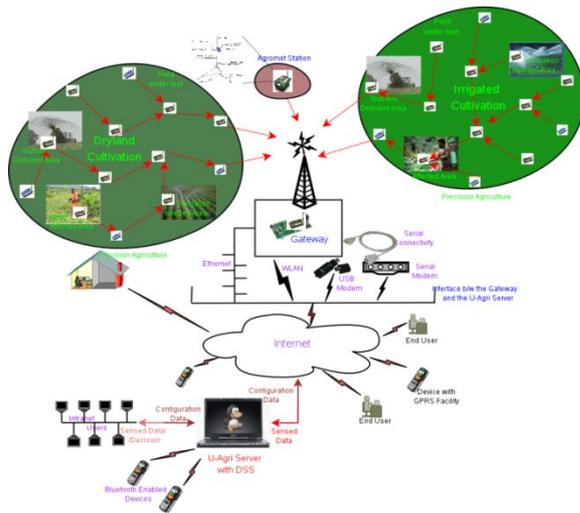


Fig. 2 Wireless Sensor Network for Precision Farming (Source: [www.ubicomp.in/uagri](http://www.ubicomp.in/uagri))

#### IV. CHALLENGES OF WSN IN PRECISION FARMING WITH RESPECT TO INDIA

A total of 107.08 million farms of the 115.6 million of total farms have an area of less than 4 ha [8]. Even though in India we have marginal farms and because of this several different challenges are there to implement WSN in PF such as:

1. Land Fragmentation.
2. Lack of highly sophisticated technical centers
3. Specific software
4. Poor economic condition of general Indian farmers [9][10].

The above said problems can be sort out by using cloud based data center in large group of farmer(s).

#### V. CLOUD BASED DATA CENTER

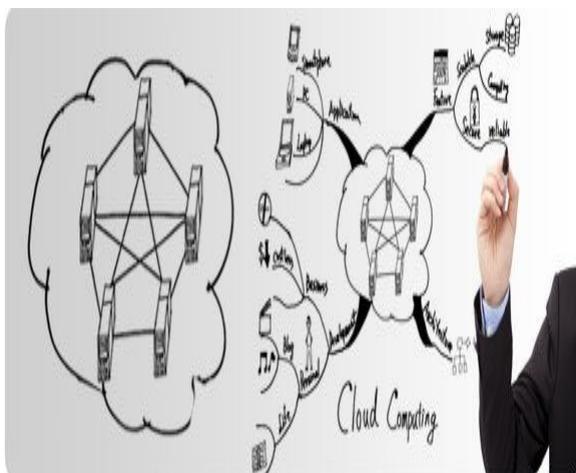


Fig. 3 Cloud Computing (Source: <http://www.compucom.com/managed-services/private-cloud-virtualization-services>)

Cloud computing involve a large number of computers connected through a real-time communication network such as the Internet.

Service Models:

#### Platform as a service (PaaS)

In the PaaS models, cloud providers deliver a computing platform, typically including operating system, programming language execution environment, database, and web server

#### Software as a service (SaaS)

In the business model using software as a service (SaaS), users are provided access to application software and databases

#### Infrastructure as a service (IaaS)

In the most basic cloud-service model, providers of IaaS offer computers – physical or (more often) virtual machines – and other resources.

### VI. PROPOSED CLOUD BASED DATA CENTER FOR PF

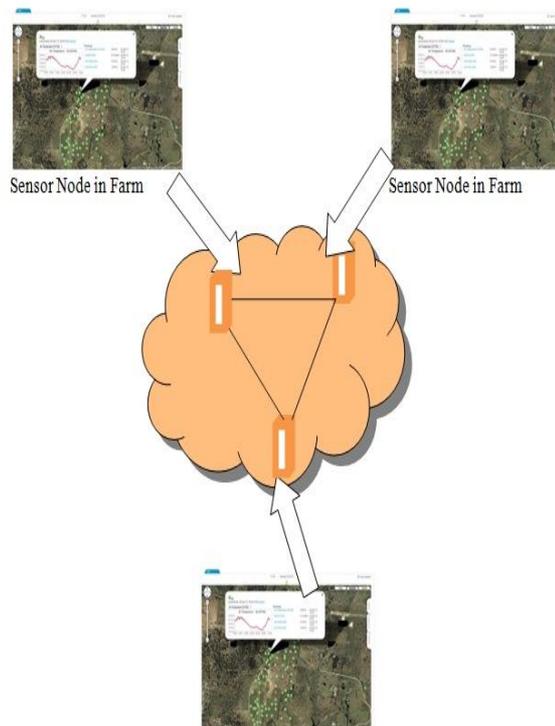


Fig : Sensor Node in Farm (Source:[http://acbi.net.au/wp-content/uploads/2012/11/soil\\_moisture\\_data1.jpg](http://acbi.net.au/wp-content/uploads/2012/11/soil_moisture_data1.jpg))

### VII. ADVANTAGES CLOUD BASED DATA CENTER FOR PF

1. Time Savings: - Fast turnaround in terms of implementation; drives down administrative time.
2. Cost Reduction: - Reduces capital expenditure - lower hardware costs, license, maintenance, back-up and overhead costs (e.g. electricity, air-conditioning etc.)
3. Internal Process Improvement:- Streamlines internal processes – can deploy environments

for development, test or support functions instantly from templates

4. Increased Collaboration and Openness:- Creates team spirit and involvement. More information is shared.
5. Increased Scalability:- Can provide services ad hoc on the scale that is needed any particular time
6. More Traceable and Transparent: - Full documentation available and traceability.

## CONCLUSION

In developing countries like India, where Poor economic condition and land fragmentation is there in general farmer, Precision farming is seems difficult as the cost of data center is huge and to implement such data centers in individual levels are impossible for these poor farmer, Cloud Based Data Center act as remedy. Group of such farmer and / or associations of such farmer can implement this Data Centers so that it low the investment per farmer and increases profitability.

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