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Review Article

An Analysis on Smart Agriculture by Using Energy-Efficient Wireless Sensor Network

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Abstract: The agriculture sector is the main building block of India and approximately 71% of individuals are based on it. The agriculture production yield ought to be inclined speedily for local population in our country. In this contemporary world, many real-time problems are solved by using the WSN. However, in the agriculture WSN is used for observing, calculating temperature and agriculture yield, inundation system, calculating water supply because the agriculture is predominant for many living organisms. The yield is affected by numerous problems such as, climate change, natural disaster and environmental changes. Wireless sensor network works for communication wirelessly. So, that data sensed from the sensor node can be collected at the base station. This Collected data will be further processed and analysed. The wireless agriculture sensors are scattered in the agriculture land for extracting different information related to soil composition, like humidity, temperature, moisture levels, and water level finders and also increase the overall productivity of the agriculture. In this article, we are comparing the different energy efficient algorithms such as; LEACH, PSO algorithm, BFAO algorithm and proposed method with each other to determine the network throughput, packet drop ratio, no. of alive nodes, variance and residual energy.

Keywords: Sensor nodes, Wireless Sensor Network (WSN), Cluster Head (CH), energy efficiency, data security, signal strength.

1. INTRODUCTION

Wireless Sensor Network (WSN) is the transformation of a collection of different numbers of small sensor hubs disseminated in a specially appointed way. Sensors are distributed in a very thick manner across large areas. These sensor hubs are small devices and low power which can perform different capacities. WSN is spatially distributed sensor to monitor various conditions such as sound, pressure & temperature and to jointly pass their data through the network to a desired location. Wireless communication can be achieved through WSN. So, data sensed from the sensor node can be collected at the base station (BS). The data that has been collected will be processed and analyzed in greater detail. Wireless sensor networks (WSNs) have a variety of applications, including communication, agriculture, industry, smart health, monitoring, and surveillance.

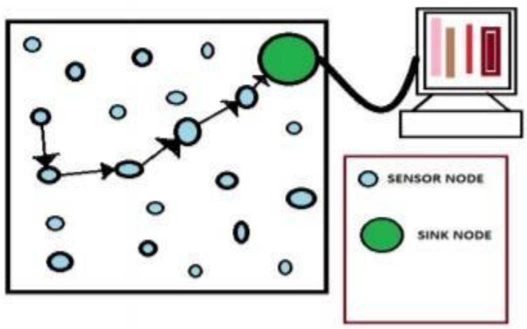

Figure 1.1: Wireless Sensor Network (WSN) [1]

2. Types of WSNs (Wireless Sensor Network):

Wireless networks are commonly employed on land, underground, and underwater. Network frameworks are faced with various challenges and constraints based on their environment. We discuss a five types of wireless sensor networks are:

2.1 Terrestrial Wireless Sensor Networks: In TWSNs (Terrestrial Wireless Sensor Networks), the nodes are deployed above the ground surface. MEMS technology has been created through the creation of smart, small-sized, and low-cost sensors. A large number of low-cost nodes, ranging from hundreds to thousands, are deployed on land in a particular area in an ad-hoc manner. Sensor nodes in terrestrial WSNs must have the ability to communicate with other nodes and send data back to the base station in a dense environment.

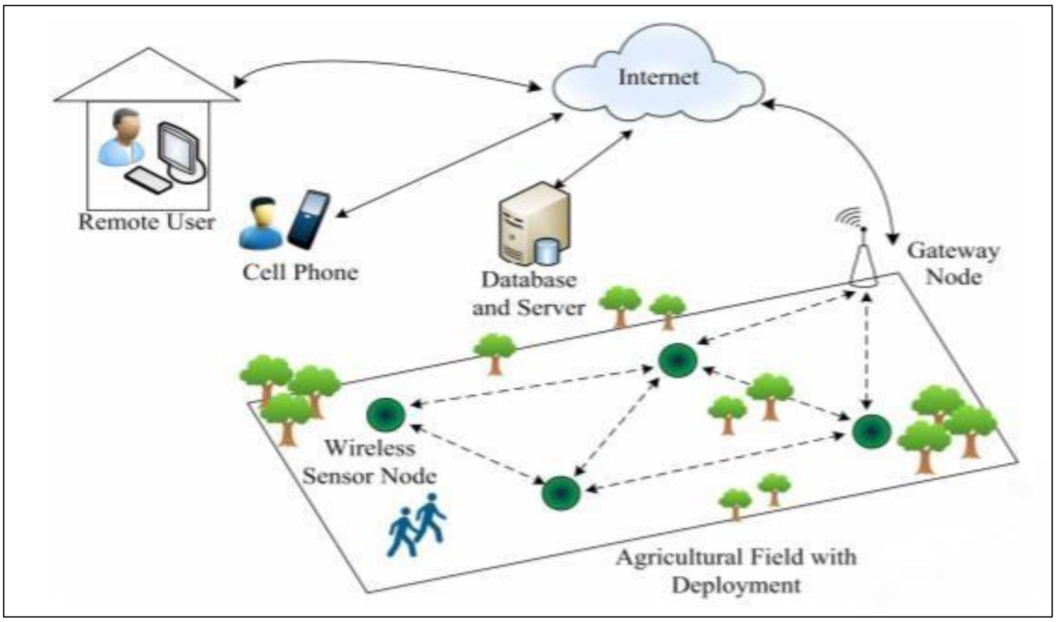

Figure 2.1: A typical wireless sensor network deployed for agricultural applications [1]

2.2 Wireless Underground Sensor Networks: Wireless Underground Sensor Networks are formed by a group of sensor nodes that are placed in caves, mines, or underground to monitor conditions underground. In order to transmit information from the underground sensor nodes to the base station, additional sink nodes are placed above ground. Due to the need for proper equipment to ensure reliable communication through soil, rocks, and water, these types of networks are more expensive than terrestrial WSNs.

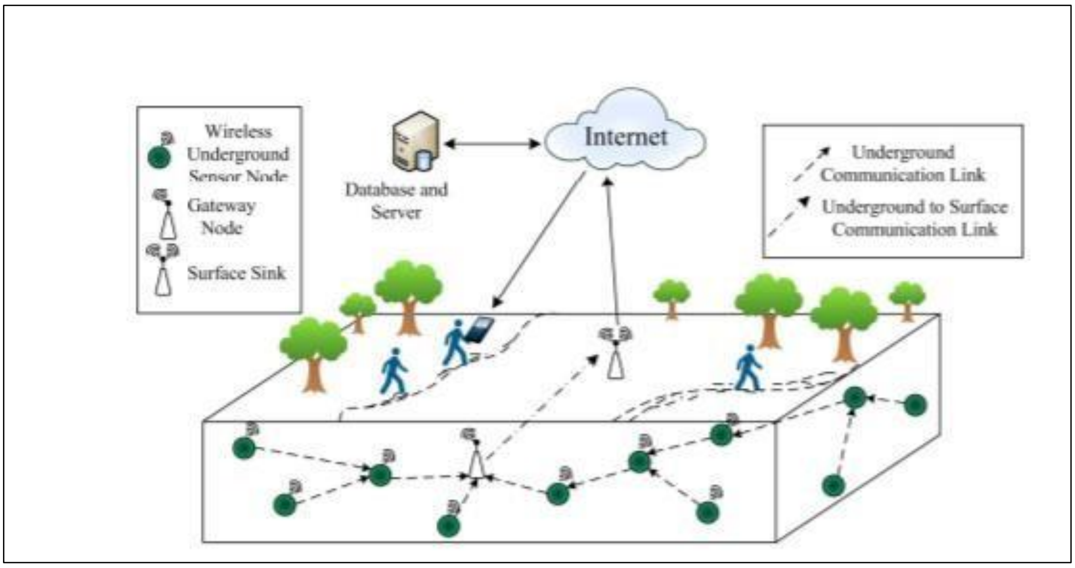

Figure 2.2: A typical wireless underground sensor network for agricultural applications [1]

2.1.1 Wireless sensors and networks' applications in agriculture

Agriculture plays a important role in the development of human growing and production. Here, we use some agricultural sensors for e.g. soil sensor, air sensor, temperature sensor, water sensor, humidity sensor etc. Agriculture is considered one of the most suitable applications for WSNs to enhance food production, crop yields, and decrease farmers' burden [2].

What is the reason for the use of sensors in agriculture?

Sensors are utilized to gather and monitor environmental attributes, while actuators are employed to store feedback and control situations. Agriculture necessitates a variety of requirements.

1. Gather data on the weather, crops, and soil.
2. Keeping track of distributed land and other farms.
3. A lot of crops are growing on the land.
4. Fertilizer and water requirements vary based on the type of uneven land.
5. Requirements for crops and seeds that are valid in different weather and soil conditions.
6. Rather than reacting, opt for appropriate or proactive solutions [3].

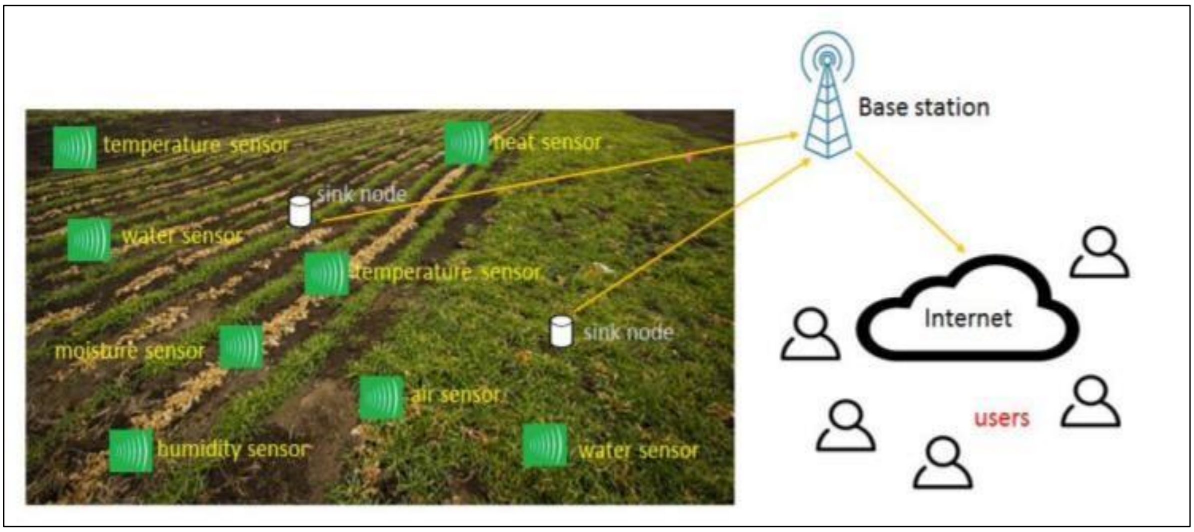

Figure 2.1.1: Smart agricultural environment based on wireless sensor network (WSN) [4]

3. LITERATURE SURVEY

S. No	Author(s), Years	Technique	Description, Reference	Application
1	Bandur *et al.*, (2019)	Radio Frequency Identifier (RFID),	To meet the demands of the global population, modern farming requires an increase in food production. Wireless ad-hoc and sensor networks, RFID, cloud computing, the Internet of Things (IoT), satellite monitoring, and remote sensing are all becoming more popular. UWSN networks are more costly than terrestrial WSNs due to the need for proper equipment to guarantee reliable communication across soil, rocks, and water [1].	To measure the data of TWSNs and UWSNs in ad hoc manner.
2	Abbasi *et al.*, (2014)	Zig-bee, Bluetooth, Wi-Fi, GPRS, Lo-Ra, SigFox Protocol	The most convenient technologies are those that use less power and have longer communication ranges, such as Zig-bee, Bluetooth, Wi-Fi, GPRS, Lo-Ra, and SigFox [2].	For measuring the signal strength between different protocols
3	Haseeb *et al.*, (2019)	Block-chain Techology	The uncertainty principal approach is used to choose non-overlapping mobile cluster heads, which leads to a decrease in routing overhead and communication costs in large networks. The block-chain architecture is used to create multihop routing paths [3].	For uncertainty principal approach

S. No	Author(s), Years	Technique	Description, Reference	Application
4	Dvir *et al.*, (2018)	single-hop routing	The main aim of this paper is to present an energy-efficient and secure IoT-based WSN framework for smart agriculture applications, which includes real-time monitoring. The purpose of this framework is to select a single-hop routing for data transmission, which reduces the possibility of bottlenecks between agriculture sensors and BS [4].	Its helpful to minimize The chance of bottlenecks between different data transmission
5	Alaparthy *et al.*, (2018)		Here, a multi level intrusion detection System IDS has been created using biological models and artificial immune systems to create computer networks that can be easily modified to accommodate other resource-constrained networks [5].	Its used in multi level intrusion detection system.

4. PROPOSED SYSTERM

This article is employed to monitor crops through wireless sensor networks and to decrease the crop disease ratio in order to increase productivity. Furthermore, the farmer has the capacity to examine the water level, humidity, other imperfections, and moisture levels. In this paper we are using the Proposed method to increase the agriculture yield production and minimize the cost of production.

4.1 Algorithm for ABC

Step 1. Build a network in small area. This area will be distributed with number of nodes. The position of each node is decided randomly.
Step 2. To identify the CH based on the fitness value that is estimated by each node.
Step 3. Start the parameters N, n; and in worker bee phase for generating new food origin.
Step 4. Observer bee phase for alternating the food sources dependent on quality.
Step 5. Outrider bee phase for finding new food sources.
Step 6. After conserving the best food source found till the end while output the best solution found.

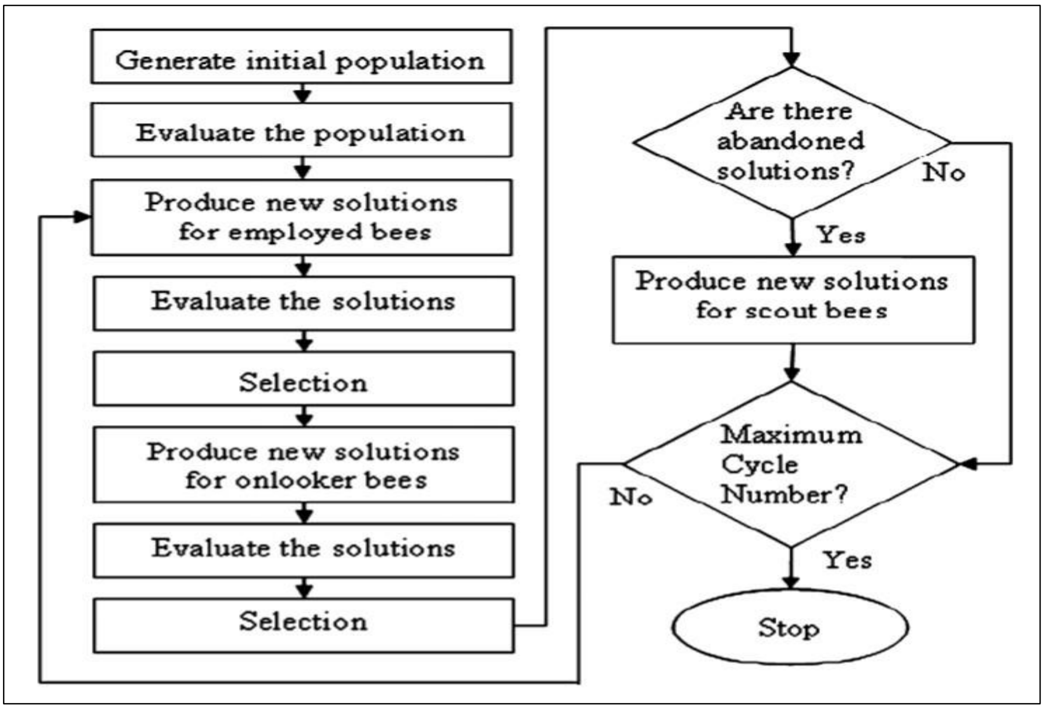

Figure 4.1: Flow chart of ABC Algorithm

5. CONCLUSION

In current research which is based on comparative analysis for various hierarchy cluster-based routing protocols. Here, we have compared these four protocols on the basis of network throughput, number of dead nodes, number of alive nodes, residual energy, and variance, Packet drop ratio and network latency In Proposed framework, Cluster Head selection is based on the fitness value that is calculated by each sensor node. It gives the greater number of alive nodes as compared to LEACH, PSO, and BFOA. The proposed scheme provides the expected number of clusters, which is automatically increase the lifetime of WSN.

6. FUTURE SCOPE

In future this ABC protocol can be compared with hybrid protocol (Combination of any two protocols) by taking different parameters and find which one is better.

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