PROBLEMS IN COLLECTING DATA TRACKING IN AGRICULTURE

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Abstract

In modern agriculture, tracking data collection has become an essential part of farm management. However, it is not without its challenges. This study seeks to highlight the most common problems encountered in this process, such as the difficulty in obtaining accurate data due to a lack of standardization and quality control. It is crucial to raise awareness of these issues as they directly impact the quality of farm management data. IoT is a technology of the future that offers a efficient and reliable solutions for modernising agriculture. These solutions are being developed to automate farm maintenance and monitoring with minimal human involvement. While the use of IoT (Internet of Things) technologies provides numerous benefits to farmers, it presents its own set of challenges, such as cost and compatibility issues. Despite the challenges, there are ways to mitigate them, such as utilizing data management systems and working with vendors to ensure compatibility. Overall, it is important to address these problems to improve the efficiency and sustainability of modern agriculture.

Key words: modern agriculture, tracking data, farm management

In the recent years, the Internet of Things (IoTs) has begun to play a major role in daily lives, extending our perceptions and ability to modify the environment around us. Particularly the agro-industrial and environmental fields apply IoTs in both diagnostics and control (Muangprathub J. *et al*, 2019). Agriculture is one of the sectors strongly influenced by advances in IoT, which is evolving rapidly and from which many new applications and services are emerging (Tzounis A. *et al*, 2017).

IoT helps collect data in every step of the agricultural production and agrifood supply chain management (Liu Y. *et al*, 2021). Monitoring the environmental conditions or crop productivity is not only the factor for the evaluation of crop but there are many other factors which effect the crops' productivity, e.g. field management, soil and crop monitoring, movement of an unwanted object, attacks of wild animals, and thefts etc. (Zhang X. *et al*, 2017; Agrawal H. *et al*, 2019). Moreover, IoT provides a well-organized scheduling of restricted resources which makes sure that the best use of IoT enhances the productivity (Farooq M.S. *et al*, 2019).

Using IoT for position tracking has proven invaluable in the market, particularly in farm management, from employee accountability to optimising resource consumption. Their importance has led to a surge in IoT device manufacturers, each with their own unique features. From purchase to reaping the benefits of these devices, several steps are involved, including installation, monitoring and data analysis. However, if these steps are not executed properly, the collected data can be inaccurate.

Other challenges would be: the existence of multiple types of sensors with different communication interfaces and incompatible communication protocols, which re- quire a lot of software and hardware and make later expansion difficult; research on monitoring and perception of agricultural IoT mainly focus on data acquisition and single-machine processing, while research on complete application systems is lacking. The research and application of intelligent agricultural machinery IoT have focused more on the optimization of a few single technologies (Xu *J. et al*, 2022).

This paper aims to present a few of common problems encountered when collecting and processing data, which are essential to avoid in order to achieve a good outcome. By addressing these challenges, farmers and other businesses can fully harness the potential of IoT devices in improving their operations, leading to increased efficiency and profitability. The proper use of IoT devices has become a crucial factor in modern-day business, and this article aims to outline the issues that should be considered by anyone looking to integrate them into management strategies.

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MATERIAL AND METHOD

Over several years, researchers have conducted both qualitative and quantitative studies using various methods to collect accurate data from IoT devices for position tracking. Throughout these experiments and tests, a number of challenges were encountered, leading to inadequate results.

The aim of this paper is to highlight the issues that can affect the accuracy of the processed data. Through meticulous research and careful analysis, these challenges were identified and addressed, ultimately resulting in a more reliable system for position tracking using IoT devices.

The combination of qualitative and quantitative research allowed for a comprehensive understanding of the data, providing a more robust and accurate system overall. This study presents the importance of thorough and thoughtful research in the development of new technologies, especially in the rapidly evolving field of IoT.

RESULTS AND DISCUSSIONS

CHAPTER 1. PROBLEMS IN BASIC AGRICULTURE

The traditional method of collecting work data in agriculture by manual recording using pen and paper is still prevalent in today's modern world.

Unfortunately, this method does not provide accurate data and often leads in inefficiency, especially on medium and large farms where employees have to fill in daily activity forms. These forms require detailed information about their daily activities, including what they accomplished, what machinery they used, how long the activity lasted, and the supplies they used. However, this process is time-consuming and it's not uncommon for employees to make errors or provide incomplete information. This makes it difficult to generate accurate reports, and the need for another person to verify, correlate, and store the data makes the problem even harder. This practice is not only primitive but also hinders the ability to accurately forecast future agricultural needs.

Adopting digital systems for data collection and storage offers an efficient and accurate alternative to the traditional method.

One of the major problems faced by farm managers today is the lack of direct access to farm data. Oftentimes, they have to rely on an economist to manage all the information and perform data analysis, which can be a time-consuming process.

Currently, there is no single software product that effectively meets all the needs of farmers, including the ability to track farm activities and generate reports automatically based on data collected. This is a significant challenge in modern farming, as the need for accurate and up-to-date information is critical to the success of any farming operation. Nevertheless, with continued advances in technology and data management, it is hoped that solutions will emerge to address these challenges and enable farmers to manage their operations more efficiently.
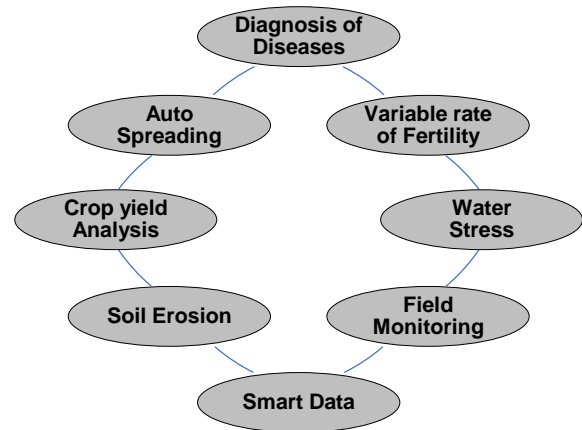

Figure 1 **Directions for applying IoT in agriculture**

Collecting and managing large amounts of data is a major limitation in modern agriculture. For agricultural economists, managing this data can be an overwhelming task, which can lead to a lack of efficiency in decision-making.

It is essential for farms to have robust data collection and management technologies to store, process, and analyse data efficiently. With such a system, farmers can make informed decisions regarding crop and livestock management and quickly identify any development problems before they become more severe.

In the smart agriculture domain, besides the main problems of sensing, collecting data, and controlling devices to respond to the real farming environment, data storage and processing are also important problems and face some challenges (Alfred R. *et al*, 2021; Kour V.P. *et al*, 2020). In reality, the number of collected data is huge, and traditional data storage, organization, and processing solutions are not feasible. Therefore, big data processing solutions need to be researched and applied for smart agriculture (López I.D. *et al*, 2020; Bhat S.A. *et al*, 2021; Quy V.K. *et al*, 2022).

Investing in data management technology can have significant benefits in the successful management of a farm. With the right tools, farmers can optimise their operations, improve productivity and achieve long-term success.

CHAPTER 2. IOT TECHNOLOGIES AND DATA COLLECTION PROBLEMS

Despite the challenges associated with external devices on farm machinery, the benefits of using this technology are significant. By tracking tractors and other agricultural machinery, farmers can monitor their use, identify potential issues and optimise their operations. This can lead to increased efficiency, reduced downtime and ultimately, higher yields. The use of these devices can also help farmers to reduce their environmental impact by minimising the use of inputs such as fertilizers and pesticides.

In modern agriculture, the use of external tracking devices for farm machinery is a highly advantageous solution, but it comes with its own set of challenges. The most often cited reasons for their limited implementation include the fixed location of sensors, their high price and the large number of required devices leading to large investments, especially for larger areas (Petkovics I. *et al*, 2017).

As these devices are comprised of a significant variety of electronic components, they are susceptible to damage due from the vibrations to which the machines are subjected during operation. In addition, extreme weather conditions such as high temperatures, sun exposure, rain and cold can also cause malfunctions of these devices, leading to inaccurate data.

Despite these challenges, the external location of these devices is crucial for obtaining precise GPS data. Proper design and implementation of these devices is necessary to ensure their durability and accuracy in harsh agricultural environments. Overall, the benefits of using external tracking devices in agriculture far outweigh the challenges they can present, providing farmers with valuable information to optimise their operations and increase productivity.

When it comes to using tractors for certain operations, one of the biggest challenges is the lack of access to remote areas or limited GSM signal coverage. Sometimes, even within the same plot, signal strength can vary and relocating the device from one spot to another can be a daunting task, especially when it comes to transmitting data to the server or cloud. Furthermore, prolonged exposure to areas without adequate signal coverage can also be a problem, as real-time data cannot be obtained, making the operator unaware of any issues that may arise during operation. Therefore, timely and accurate data transmission is crucial for effective and efficient use of tractors.

Data collection and analysis have become increasingly important in modern agriculture, but the cost of these technologies can be prohibitive for many farmers and agricultural enterprises. Data-gathering devices can be expensive to purchase, and even when they are available, require skilled personnel to manage and to provide maintenance. Moreover, raw data collected by these devices needs to be transformed into useful information that can be interpreted by farmers. This process requires the development of complex algorithms and data analysis, which can also be quite costly due to the need for skilled professionals in this field. In addition, creating applications and managing servers to store data can be a significant expense, requiring investment in administration and data protection.

Despite these challenges, investing in data collection and analysis technologies can provide significant benefits to those who can afford it, including improved efficiency, increased productivity and better decision-making in farming operations. It is therefore essential to strike a balance between the costs of investing in data collection and analysis technologies and the potential benefits they can provide to farmers and agricultural enterprises.

CONCLUSIONS

A variety of indicators suggest that the availability of sensors, mapping technology, and tracking technologies have changed many farming systems and the management of the food system as it flows from producers to consumers (Coble K.H. *et al*, 2018).

The imperative to replace old methods of data collection with manual recording is increasingly evident, especially in the context of advanced technologies. The availability of automated devices and data collection software makes it much easier to achieve targets with high efficiency.

Tracking machinery and farming operations and collecting real-time data can make the production process more efficient by discovering technical problems or other inconsistencies at the right time, as well as making efficient use of available resources, resulting in a positive environmental impact.

To optimise farm operations, the right tools need to be introduced, and this can be achieved through an open knowledge approach. For the most effective implementation of IoT in the agricultural sector, there is a need for collaboration between specialists in different fields and the sharing of existing information, as well as for farmers to work together to use data from the same area in the common interest of high yields and environmental protection.

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