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A Case Study of the Management Information System in the Coffee Industry in SW Ethiopia

Mequanint Birhan[1]

1 Mizan Tepi University

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Abstract

The 11th regional state in southwest Ethiopia, the South West Ethiopia Peoples' Region (SWER), is well-reachable for various coffee species and cultivation. According to a tradition, in the ninth century, the goat herder Kaldi first saw the potential of these well-loved beans in one of the region's zones, namely Kefa. The research article's main goal is to examine the impact of management information systems (MIS) on the coffee farm sector in SWER. Direct site observation and secondary data reviews on the subject were the methods used to obtain the data. The review's findings demonstrated that using management information systems worked substantially better when important industry informants participated actively and made decisions about stress. The SWER which was coffee-abundant and developed using traditional ways, should provide information management synchronization systems. The birthplace of coffee (Ethiopia) could use technologies for assessing MIS implementation tasks to remove difficulty at high speed in the intelligibility levels. Triple constraints like time, cost, and quality of information must be managed.

Mequanint Birhan (MSc, MBA)

Mechanical & Industrial Engineering Lecturer, Mizan Tepi University, Ethiopia

PoBox 121. Phone number: +251920246558. Email:mequanint@mtu.edu.et

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Introduction

A newly-developed business and organizational management concept, management information systems (MIS), is an integrated system of people, machines, programs, and procedures that provides information to support transactions, operations, and decision-making within an organization for effective/efficient management. Then, simplifying the management of complex, enormous, and unmanaged data to carry out business operations at numerous organizational levels was very important (Adhikari, 2023).

Figure 1.1. Traditional collections in coffee abundant country Ethiopia

Agriculture, which produces food and a variety of biological and industrial products, is crucial for supplying human needs. Approximately one in ten people globally experience hunger, and many more experience food insecurity, micronutrient deficiencies, and diet-related illnesses despite yearly improvements in agricultural productivity (Zhao et al., 2023). For example, in the case of coffee, intensive studies of the farmers, manufacturers, wholesalers, and retailers in the upstream, midstream, and downstream of the product platform are necessary (Arre et al., 2021). Coffee is thought to provide you with more energy before an activity and relieve exhaustion and lethargy. Because coffee is seen as a stimulant (added energy) before engaging in intense activities during the day and a sleepiness reliever, people who enjoy drinking coffee tend to make it their favorite beverage or regularly use it (Laumal et al., 2019). Coffee beans, one of the major products in northern Thailand, are used to make coffee goods. While Arabica coffee is often grown and harvested in this region due to the height and local climatic conditions. It is a widely consumed beverage that has been sold for a long time and is experiencing steady market expansion (Arre et al., 2021). Hence, a system for classifying, evaluating, transmitting, and

disseminating the information needed by decision-makers is referred to as a management information system (MIS). It includes people, machines, equipment, procedures, and legislation. It is a collection of tools that are used to gather, process, store, retrieve, and deliver data to the beneficiaries utilizing a variety of communication channels. Higher management concerns, training, human resources, material resources, and software were selected as the aspects of MIS, which indicate the need for creating MIS (Atheeb & Musehibe, 2021).

The agricultural sector can start creating processed goods that can be used in various ways, changing the paradigm and thinking that it is exclusively about farming. Because they have up until now only used comparatives, farmers or other important participants in the supply chain are also unsure of how to boost competition (Panggabean et al., 2022). Prioritizing agricultural development activities is necessary to increase output capacity. This entails increasing the area of land used for a number of essential commodities and government support for agricultural growth (Panggabean et al., 2022).

When it comes to agriculture, the world is at a turning point. The need for food is rising along with the world population, which is taxing our farming systems and resources. Innovative, sustainable, and equitable ways to agriculture are urgently needed to overcome this problem. One drawback of this methodology is that the simulation findings could not accurately reflect how well the suggested framework performs in actual precision agriculture applications. This is because the simulation ignores a number of real-world variables that could have an impact on the system's performance, such as the environment, users, and unforeseen problems. Future enhancements could include integrating cutting-edge technology like edge computing and machine learning methods to improve the performance and scalability of the suggested framework. More advanced sensor technologies, including cameras and drones, can also be integrated to provide a more thorough picture of the farm environment. Additionally, using a more dynamic mobility model for the mobile situation can give precision agricultural applications a more accurate picture of how animals move (Atalla et al., 2023). Agriculture is significantly impacted by climate change, which cannot be ignored. The productivity of agriculture is significantly impacted by changes in temperature, precipitation, the frequency of extreme weather events, as well as pest and disease outbreaks. Despite significant increases in agricultural output, there is a sizable population worldwide. A significant portion of the global population experiences nutritional imbalances despite considerable increases in agricultural production (Zhao et al., 2023). Recent years have seen the agriculture sector face a number of difficulties, including population expansion, resource constraints, and climate change. To improve agricultural productivity, sustainability, and efficiency in response, new technologies have been created (Giduturi, 2023). Therefore, by offering MIS implementations, the mini-review will benefit Ethiopia's agriculture sector, particularly the coffee business.

Literature Review

These days, agricultural productivity and quality are increased through the development of agricultural technologies and digitalized agricultural practices. Agriculture 4.0 and 5.0, along with agricultural technologies in development, have made significant contributions to the global economy. As a result, it has been claimed that the agriculture advancement process lowers labor productivity and costs while increasing qualified employment, worldwide competitiveness, and income in the

nations that apply it (Aydinba, 2023). The technique of tracking and evaluating changes in the agricultural land cover over time is known as agricultural land use monitoring. It is an essential sector of the global economy, contributing significantly to both economic growth and food security. The issue facing the agriculture sector is to increase crop yields and quality while reducing environmental impact. Remote sensing (RS) and geographic information systems (GIS) have become effective tools in agriculture applications as a result of technological improvements. With the use of these instruments, farmers may make informed decisions on crop growth, soil moisture, plant health, and other critical criteria (Giduturi, 2023). Precision agriculture, RS, and GIS have changed modern agriculture. An approach to crop management known as precision agriculture, often referred to as precision farming or site-specific agriculture, makes use of technology to enhance farming methods. Data, information, knowledge, and outcome are concepts that are associated in order to carry out a certain decision-making process. The MIS is an integrated system of components used to collect, organize, extract, store, process, and distribute information for decision-making. Information systems including TPS, DAS, KWS, MIS, DSS, E.S., CSCWS, GDSS, and ESS have been developed for a variety of uses, particularly in the commercial sectors (Adhikari, 2023). The fundamental building block of wise decision-making, quality information is the ideal action for the best results. For any academic organization to get the desired results owing to effective management, MIS implementation is the most important component (Adhikari, 2023). Increased production levels through land expansion and agricultural intensification are another goal of agricultural development initiatives. Governments, farmers, businesses, and end users are paying attention to the growing adoption of sustainable agriculture. As the global market becomes more concerned with sustainability in agriculture, many producers are competing to improve their products year after year (Panggabean et al., 2022). Agricultural acceleration calls for a lot of work in order to increase agricultural productivity, agricultural capacity, and transform new agricultural products into processed goods with economic value and multiple uses. One of the challenges in growing a company in the Arabica coffee sector is the industry's lengthy and complex supply chain, which is frequently experienced from upstream to downstream. Information systems are crucial in corporations because they provide management with the tools they need to make informed decisions quickly and correctly, preventing manager errors, and gathering and storing data (Atheeb & Musehibe, 2021). Training, increased management interest, physical resources, software, and human resources are dimensions of administrative information systems (Atheeb & Musehibe, 2021).

The implementation of the IoT into several business uses, including monitoring weather conditions, soil moisture, temperature, fertility, and crop growth, as well as weed and pest detection, animal intrusion, irrigation control, and supply chain and food waste management. Farmers can monitor their farms more effectively and with less human effort by implementing IoT devices (Atalla et al., 2023). Distributors and exporters of coffee use the raw materials to produce roasted coffee beans for retail sales in coffee shops at the downstream level. Value creation is centered on two approaches to development: (1) improving current products or producing new ones, and (2) enlarging markets or identifying new target customers. Coffee production and marketing are items that add value in order to raise product prices (Arre et al., 2021). In order to make educated judgments about crop management and food security, crop yield and production forecasting is a crucial aspect of agriculture (Giduturi, 2023). The Coffee MIS consists of 3 main parts, namely Admin as a system manager who can enter purchase data, sales, and data recap, and can see and change all data entered into the system. The web-based coffee MIS is one of the efforts to develop superior products in the NTT area,

especially processed coffee. Coffee MIS was developed using the PHP programming language (Laumal et al., 2019). Agriculturists' extensive embrace of digital technology is resulting in an exponential increase in the availability of a wide range of big data that can help with better policy-making and monitoring, as well as alter the agriculture sector. The ability of agricultural scientists and extension personnel to communicate with farmers in a way that is more targeted, focused, and specific has been greatly enhanced by the falling cost of hardware, the expansion of communication network reach, and the availability of the same at the district and sub-district levels. At the continental, regional, national, and local levels, there is an issue with the absence of accurate and timely market information in the agri-input sector, which continues to be a significant barrier to the development of agricultural business relationships and trade on a worldwide scale. Using cutting-edge ICT capabilities, public and business bodies are still making tremendous progress toward adopting market information services (Ojha, 2022). Rapid technical advancements have drastically altered the agricultural sector in recent years. The agriculture industry must simultaneously meet a number of objectives and societal values while also anticipating long-term sustainability and economic viability (Groeneveld et al., 2021). A sustainable farming method known as "conservation agriculture" (CA) encourages little soil disturbance, ongoing crop rotations, and permanent soil cover. There is growing agreement that using Sustainable Intensification techniques is necessary for attaining sustainable agriculture. The use of conservation agriculture can bring about a number of agronomic advantages that improve soil production. The increase in organic matter is one of the key benefits since it enhances soil structure, water conservation, nutrient retention, and fertilizer use effectiveness (Dev et al., 2023). Without MIS, no organization can function effectively today. It denotes how MIS-based decision-making may be trusted (Adhikari, 2023). Context diagram design, data flow diagram design, entity relationship diagram (ERD) design, and data dictionary design are the stages of WEB-based management system development that are used to create information systems (Laumal et al., 2019). Through the provision of real-time data on crop and livestock conditions, IoT has the potential to revolutionize the agricultural industry. Applications for decision-making that can be combined with Internet of Things actuators to act on physical objects (like turning on a water pump) without requiring the involvement of farmers, for example, can be developed as a result of the application of data-processing algorithms to collect data(Atalla et al., 2023).

Precision agriculture relies on the farm management information system (FMIS) to help with decision-making in the agricultural industry. FMIS development is not simple and calls for the appropriate design and implementation models to enhance understandability, improve communication and analysis of design choices, and foster stakeholder collaboration. Software engineering is now more crucial than ever for achieving precision agriculture. According to Groeneveld et al. (2021), software defines the intelligence required to support the decision-making process.

Conclusion and Recommendation

It is clear from the research and assessment that there are advantages to coffee cultivation in terms of SWER size and job accommodations. Nevertheless, there are no formalized information management systems for agricultural development, personnel, land use, neighborhood data, histories, animal, or metrological data. In civilization 5.0, where machines are merged with people for a long, comfortable, and healthy existence, people are living in the information age.

In general, information is like blood, and MIS is like the body. The information must flow through an organization in order for decisions to be made that will help it expand and achieve its desired results (Adhikari, 2023).

Therefore, the farmers, agriculturalists, researchers, governmental entities, non-governmental organizations, and institutions that support education and skill development should assist in the diffusion of MIS principles into the agriculture sector. In addition to FMIS, IOT, WEB-based management systems, ICT, TPS, DAS, KWS, MIS, DSS, E.S., CSCWS, GDSS, RS, GIS, and ESS, these technologies are crucial to the growth and highest return earnings of the coffee business. It is important to pay attention to applied research for real-world applications, action research, and requests for technologists and IT specialists in the field.

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