Information Technology Integrated system and Food safety in Honey Market in Kenya

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Abstract

The honey industry in Kenya is a valuable source of income for small-scale farmers, but they face various challenges such as pests and diseases, lack of access to markets, and inadequate skills. One of the primary challenges facing the honey market in Kenya is the issue of food safety, with poor-quality honey reaching the market, exposing consumers to risks. The use of information technology (IT)-integrated systems in the honey market has gained popularity as a tool for ensuring food safety, traceability, and market access for small-scale farmers. This literature review explores the effectiveness of IT-integrated systems in enhancing food safety in the honey market in Kitui, Baringo, West-Pokot, and Elgeyo Marakwet counties in Kenya. The review identifies the challenges hindering the adoption of IT-integrated systems, including the lack of awareness and knowledge among stakeholders, high implementation costs, inadequate technical skills, and infrastructure. The review highlights the potential benefits of IT-integrated systems, including improved traceability, reduced foodborne illnesses, and enhanced market access for small-scale honey farmers. The target audience for this review is professors and scientists interested in the use of IT in food supply chains.

Key words: Honey production, Information technology, Food safety

1 Introduction

Honey production is a valuable industry in Kenya, with an estimated annual production of 7,000 metric tons. The country has a diverse range of floral and faunal resources that provide a favorable environment for honey production, and over 35,000 registered beekeepers and more than 2.5 million traditional beekeepers who keep indigenous honeybee subspecies [6].

Honey production is mainly done by small-scale farmers who face numerous challenges such as pests and diseases, lack of access to markets, and inadequate skills. The honey market is fragmented, with multiple actors involved in the value chain, from farmers to retailers. The lack of a structured value chain has resulted in poor quality honey reaching the market, exposing consumers to food safety risks [12].

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The Kenyan government is also supporting the growth of the honey industry by providing training, extension services, and infrastructure such as beekeeping equipment, honey processing plants, and marketing support [14]. Honey production not only provides a source of income for many rural households but also has significant environmental and health benefits [11].

In recent years, the use of information technology (IT) integrated systems in the honey market has gained popularity as a tool for ensuring food safety. These systems employ various technologies such as the Internet of Things (IoT), and artificial intelligence (AI) to monitor and track products from farm to fork [12]. The adoption of these systems presents opportunities for improving food safety, traceability, and market access for small-scale farmers [15]. However, the adoption of these systems faces various challenges, including the high cost of technology, inadequate skills, and lack of infrastructure.

This literature review aims to explore the effectiveness of IT-integrated systems in enhancing food safety in the honey market in Kitui, Baringo, West-Pokot, and Elgeyo Marakwet counties. The target audience for this review is professors and scientists interested in the use of IT in food supply chains.

Overview of the Honey Market in Kenya

Kenya is a significant producer of honey in Africa, with an annual production of 7,000 metric tons [6]. Honey production is mainly done by small-scale farmers who face various challenges, including pests and diseases, inadequate skills, and lack of access to markets. The honey market in Kenya is highly fragmented, with multiple actors involved, including farmers, traders, processors, and retailers. The lack of a structured value chain has resulted in poor-quality honey reaching the market, exposing consumers to food safety risks [13].

One of the primary challenges facing the honey market in Kenya is the issue of food safety. Several studies have highlighted the presence of contaminants such as antibiotics, pesticides, and heavy metals in honey sold in Kenya [3, 16]. This presents a significant risk to consumers' health and underscores the need for measures to ensure food safety in the honey market.

To address the food safety concerns in the honey market, several initiatives have been undertaken in Kenya. For example, the Kenya Bureau of Standards (KEBS) has set standards for honey quality and safety, which must be adhered to by all actors in the honey value chain [16]. Additionally, various organizations have implemented capacity building programs to enhance beekeepers' skills in honey production and handling.

Information technology (IT) integrated systems have been increasingly used as a tool to enhance food safety in the honey market in Kenya. These systems have the potential to improve traceability, reduce foodborne illnesses, and enhance consumer confidence. The use of IT in the honey supply chain in Kenya has improved traceability and transparency, which has led to increased consumer trust and confidence in the quality and safety of honey. In addition to improving traceability, IT-integrated systems have also been shown to reduce food borne illness [2] . The implementation of an IT-based food safety management system in the honey industry in Kenya led to a significant reduction in microbial contamination of honey [5] . The system involved real-time monitoring of the production process, which allowed for prompt identification and correction of potential hazards.

Furthermore, IT-integrated systems have been shown to enhance market access for

small-scale honey farmers [4]. It is anticipated that the use of IT in the honey value chain in Kenya has enabled farmers to access new markets and increase their income [9]. The system provided farmers with real-time market information and facilitated direct sales to buyers, reducing the role of intermediaries. However, the implementation of IT-integrated systems in the honey market in Kenya faces various challenges. These include high implementation costs, inadequate technical skills among stakeholders, and inadequate infrastructure. A study by [10] found that the high cost of implementing IT-based traceability systems was a major barrier to adoption by small-scale honey farmers.

Challenges

Despite the potential benefits of IT-integrated systems in enhancing food safety in the honey market in Kenya, there are several challenges that hinder their adoption. One significant challenge is the lack of awareness and knowledge among stakeholders in the honey value chain, particularly small-scale farmers and enterprises [8]. The cost of implementing these systems can be prohibitive for small-scale farmers and enterprises, which make up a significant portion of the honey market in Kenya [10]. The lack of reliable and affordable internet connectivity in some areas, particularly rural areas, is another challenge that hinders the adoption of IT-integrated systems. Additionally, inadequate training and technical support for users of these systems can hinder their effectiveness [8].

Opportunities

Despite these challenges, there are opportunities for the adoption of IT-integrated systems in the honey market in Kenya. One opportunity is the increasing demand for safe and traceable food products, particularly in the international market, which could create a competitive advantage for enterprises that adopt IT-integrated systems [1]. Furthermore, the Kenyan government has made efforts to improve the country's digital infrastructure, including the provision of affordable internet connectivity, which could increase access to IT-integrated systems for small-scale farmers and enterprises [17]. The increasing availability of affordable and user-friendly IT-integrated systems is also an opportunity for the adoption of these systems in the honey market in Kenya [8].

2 Conclusion

The honey market in Kenya faces several food safety-related challenges, including lack of awareness and knowledge, limited resources, and inadequate value chain structures. However, the adoption of IT integrated systems presents significant opportunities for enhancing food safety and traceability. The use of IoT sensors and blockchain technology can ensure the quality of honey and protect consumers from foodborne illnesses. The implementation of these systems faces various challenges, including the cost of implementation, lack of technical skills, and inadequate infrastructure. However, the opportunities presented by IT-integrated systems are significant in improving the livelihoods of small-scale farmers and ensuring consumer safety.

Future research can explore ways to address the challenges associated with the adoption of IT-integrated systems and how to make them accessible to small-scale farmers. Additionally, there is a need to evaluate the effectiveness of these systems in the long

term, particularly in ensuring that the benefits outweigh the costs.

Recommendation

The literature review reveals that the honey market in Kenya is mainly composed of small-scale farmers who face various challenges such as pests and diseases, inadequate skills, and lack of access to markets. The lack of structured value chains in the market has resulted in poor quality honey reaching consumers, posing food safety risks. However, the use of IT-integrated systems such as IoT sensors and blockchain technology has shown potential in enhancing traceability and food safety. These systems face challenges such as the lack of awareness and knowledge among stakeholders and the cost of implementation. Nonetheless, the opportunities presented by IT-integrated systems are significant in improving the livelihoods of small-scale farmers and ensuring consumer safety. Further research is needed to evaluate the effectiveness of these systems in the long term and explore ways to make them accessible to small-scale farmers.

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