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The Role of Technology in Increasing Agricultural Productivity

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Abstract
Rapid population growth and global climate change have placed significant pressure on the agricultural sector to increase productivity and efficiency. In this context, technology has become the main key in introducing innovations that push agriculture towards sustainability. This article presents a literature review of various technologies that have been applied in modern agriculture to increase crop yields, resource use efficiency, and resilience to environmental change. By analyzing various case studies and related research, it can be concluded that the integration of information technology, sensors, robotics and artificial intelligence has opened up new opportunities for farmers to increase productivity and face current global challenges. Policy implications and future research directions are also discussed in the context of the application of this technology in agriculture.

Keywords: technology, agricultural productivity

INTRODUCTION

Agriculture has become a vital sector in maintaining food security and supporting human welfare. In the midst of global pressures such as rapid population growth and increasingly obvious climate change, the need to increase agricultural productivity becomes very important. In this context, technology plays a key role in facing these challenges and opening up new opportunities for increasing the efficiency and productivity of the agricultural sector.

Developments in information technology, sensors, robotics and artificial intelligence have brought about a significant transformation in the way we understand and manage agricultural processes. Research and implementation of this technology has offered innovative solutions to increase crop yields, optimize resource use, and increase agricultural resilience to environmental change.

In this context, this research aims to investigate the role of technology in increasing agricultural productivity through a comprehensive literature review. By exploring various case studies and recent findings, it is hoped to provide in-depth insight into how technology has shaped and will continue to shape the future of agriculture globally. In addition, policy implications and future research directions will also be discussed to provide a broader view of the impact of technology in increasing agricultural productivity in a sustainable manner.

The research entitled "Segmenting, Targeting, Positioning, and SWOT Analysis as a Marketing Strategy for Karlos Coffee (Study of Karlos Coffee Producers in Donowarih Village, Karangploso District, Malang Regency)" explores marketing strategies specifically for industrial coffee, emphasizing the importance of coffee as the main commodity in Indonesian agriculture. This highlights the important role of agricultural products such as coffee in the country's economy. In addition, the article "Sterile Insect Technique as an Alternative to Control Fly Density and Prevent Diarrhea Disease: A Systematic Review"[1]examines the Sterile Insect Technique (SIT) as a viable method for managing fly populations, especially in agricultural environments. This shows the adoption of innovative approaches to pest control in agriculture, reflecting ongoing advances in agricultural practices. These sources collectively outline the agricultural landscape in

Indonesia, emphasizing the value of agricultural products such as coffee and the integration of new techniques in pest management in agricultural environments.

LITERATURE REVIEW

Technology has a significant role in increasing agricultural productivity. The application of agricultural technology innovation has been proven to increase the productivity of agricultural businesses, which in turn can improve the welfare of farmers and the food security of farming households[2]. One important aspect in increasing agricultural productivity is agricultural mechanization, which aims to increase labor productivity, land and reduce production costs[3]. Apart from that, innovations such as the use of fertilizers, pesticides and irrigation also have a positive impact on agricultural productivity. For example, fertilizer elements have a significant mitigating impact on agricultural productivity growth, and enhancing these factors can significantly increase agricultural productivity. The use of information technology also plays an important role in increasing the effectiveness, productivity and competitiveness of companies, including in the agricultural sector[4]. Apart from that, mastery and use of technology by farmers is also needed to support technology-based agricultural extension, especially in information pandemic conditions like this[5].

In the context of agricultural development, the role of agricultural extension workers is also very important in increasing knowledge and changing farmer behavior to adopt technological innovations that can increase agricultural productivity.[6]. Apart from that, the application of precision technology and the use of Internet of Things (IoT) based sensors can also help in increasing and optimizing agricultural production[7]. Thus, through the application of agricultural technological innovation, mechanization, the appropriate use of fertilizers and pesticides, as well as the use of technological information, agricultural productivity can be effectively increased and ultimately improved farmers' welfare and the food security of farming households. 1. "Application of Agricultural Technology Innovation and its Relationship to Farmer Household Food Security" Extension journal (2016) 2. "Benefits of Agricultural Land Resource Technology Innovation in Helping Agricultural Development" Land resources journal (2020) 3. "Relationship between Innovation Stages in the Process Rice Transplanter Decisions for Farmers in Trucuk District, Klaten Regency" West science multidisciplinary journal (2023) 4. "AGRICULTURAL PRODUCTIVITY: A LITERATURE REVIEW" AgroSciences (agsci) (2022) 5. "DESIGN OF GOODS INVENTORY INFORMATION SYSTEMS IN THE BUANA SENTOSA COPYRIGHT COMPANY WEB-BASED WITH EXTREME PROGRAMING METHODS" Cess (journal of computer engineering systems and science) (2018) 6. "Information Technology-Based Agricultural Extension in Bone Bolango Regency" Journal of agricultural economics and agribusiness (2022) 7. "Various Uses of Information and Communication Technology (ICT) for Agricultural Information during the Pandemic" Journal of development communication (2022) 8. "The Role of Extension Officers in the Process of Adopting Farmer Innovations in Supporting Agricultural Development" Agribios (2022) 9. "Monitoring Rainfall and Soil Wetness on Agricultural Land Using Internet-Based Sensors of Things (IoT) as a Basis for Precision Agriculture" Scientific journal of agricultural technology aggrotech (2021)

RESEARCH METHOD

Research methods in increasing agricultural productivity are an important topic in the development of the agricultural sector. Various studies have been conducted to explore the

relationship between technology, innovation, productivity and poverty in the agricultural context. One of the findings shows that the application of agricultural technology innovation can increase the productivity of agricultural businesses and has the potential to improve the welfare of farmers and the food security of farming households[2].

RESULTS AND DISCUSSION

The role of technology in increasing agricultural productivity has been studied extensively. Study[2]shows that there is a significant positive relationship between the application of agricultural technology innovation and household food security, resulting in increased farmer income and improved food security conditions. Instead research[8]shows a lack of variables that influence agricultural productivity, which indicates the need for further exploration of the factors that influence productivity in agriculture. Furthermore[9]highlighting the important role of Islamic microfinance in sustainable rural food security, emphasizing its importance in economic development, technology adoption, mechanization and poverty alleviation in the agricultural sector. Besides that,[10]discusses the use of smart agricultural systems based on the Internet of Things (IoT) to increase productivity, facilitate farmers' work, and encourage precision agricultural practices. In conclusion, these studies collectively emphasize the importance of technological interventions, financial support mechanisms, and innovative approaches in boosting agricultural productivity and sustainability. By utilizing technological advances, implementing sustainable practices, and integrating modern agricultural systems, productivity, food security, and farmers' livelihoods can be improved

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