EFFECTIVE AGROTECHNOLOGY IMPLEMENTATION TOWARD CROP HARVESTING IMPROVEMENT

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The thesis is submitted in partial fulfilment of the requirement for the award of bachelor's degree of Technology Management (Innovation) with Honours.

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SUPERVISOR AND PANEL DECLARATION/APPROVAL

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DEDICATION

Every challenging task requires sacrifices, self-effort, strength from God Almighty as well as my beloved families. To the Almighty Lord our God, respected lecturers, families and good friends who provided their knowledge and time to guide me in completing this thesis.

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ABSTRACT

Agrotechnology has been known for many years but a are so many people that do not know about it or know about the benefits for implementing it in their farming activities. The researcher believes that agrotechnology can bring so much benefits to farmers as long as they are willing to learn about it. This agrotechnology can give the opportunity to people in Sabah to explore the world of entrepreneurship and gain more income since there are limited job opportunity there. The objective for this thesis is to examine how farmers get to the maximum production of their yields, to determine whether farmer's labour cost will be much easier with the technology implementation and finally to determine what benefits farmers will get from implementation agrotechnology. The independent variable in this research framework is make job easier, IoT and management efficiency while for dependent variables are better output, simplify activities, continuous supply, shorter time and increased shelved life. The methodology that researcher uses for this thesis is quantitative method and the researcher used Krejcie and Morgan (1970) in order to determining the sample size, Therefore, the sample size that the researcher use to obtain the data was 849 individuals. For the data analysis researcher uses descriptive analysis, reliability analysis, Pearson Correlation analysis and linear regression analysis to analyse the data.

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CHAPTER 1

INTRODUCTION

1.1 Introduction

This chapter will include the information about the effective agrotechnology implementation toward crop harvesting improvement in Sabah. Researcher will explain about how agrotechnology help to make improvement in crop harvesting. Researcher also believe that this research will help the people in Sabah to be more knowledgeable about the importance of agrotechnology implementation. This chapter discusses about the background of study, problem statement, research questions, research objectives, significance of study and scope of study.

1.2 Background study

1.1.2 Agriculture

Agriculture has long been acknowledged as playing a critical role in development. Agriculture was recognized as a source of contributions that helped induce industrial progress and a structural change in the economy in the primary study on the subject. (D. Byrlee, A. De Janvry, and E. Sadoulet, 2009). Agricultural production and productivity have changed dramatically in the last 50-100 years, owing in large part to governmental and private expenditures in agricultural research, with far-reaching repercussions (Alston, Julian M., and Philip G. Pardey. 2014) The art and science of cultivating the land, growing crops, and raising livestock are known as agriculture. It entails preparing plant and animal goods for human consumption as well as their delivery to markets. Agriculture is responsible for the majority of the world's food and textiles. Agricultural items include cotton, wool, and leather. Wood for building and paper goods are also provided by agriculture. These goods, as well as the agricultural, practices utilized, may differ from one region to the next. (The art and science of agriculture, Society, 2011) Agricultural chemistry includes the use of chemical fertilizers, insecticides, fungicides, soil composition, agricultural product analysis, and farm animal nutrition. The green revolution began in the Western world and extended many of these advances to farms all over the world, with varying degrees of success. Hydroponics, plant breeding, hybridization, gene modification, better soil nutrient management, and enhanced weed control are some of the other recent improvements in agriculture. Crops with capacities beyond those of naturally occurring plants, such as increased yields and disease resistance, have resulted through genetic engineering. Because modified seeds germinate faster, they may be planted over a larger area. (ScienceDaily,2021)

1.3 Agrotechnology

Agrotechnology is the combination between the technology and agriculture where the agrotechnology knowledge is growing every year. The agrotechnology is purposely to make the crops and plants to grow much faster and give the farmers to have the maximum yields production in better way and easier way and less time taken for harvesting. Harvesting is the process of collecting the plant's usable portion or pieces after all of the elements have matured and the consumable sections have acquired the right maturity level. Harvesting occurs 10 to 15 days after the seed has attained fruit maturity. It entails cutting, gathering, and conditioning bioenergy to prepare them for later activities. (Mathanker, S. K., & Hansen, A. C. 2014). According to RP Thompson (2011) technology able to reduce the impact to the environment and did not effect the supply of food, price and consumers health.

Agrotechnology also give the farmers benefits in terms of water management where agrotechnology can ensure adequate water supply to the plants because the water will be supply automatically to the plants. using sophisticated water management technologies that are climate-dependent to irrigate the land, transforming the future of agriculture. With the use of specialist equipment like sensors, IoT in agriculture may autonomously water a field without the need for human involvement. Freshwater resource management is one example of a limited natural resource that requires integration of wireless sensor networks and mobile apps. Through precision agriculture, IoT in agriculture enables the best use of resources to provide high crop yields and lower operating costs. (Sayali Wadekar, Et al, 2016). Good water management in agrotechnology also gives benefits to the plants such as healthier root system. A plant's root system is severely impacted by oxygen shortage, which can result in root infections. A high oxygen content in the root zone creates ideal circumstances for root development, which improves plant health in general. (S Naeem, F Naeem et al, 2021). Strongly oxidising in nature, oxygen rids water of undesirable substances like heavy metals while promoting the growth of probiotic microbes that are good for you. Additionally, water with oxygen nanobubbles encourages the decrease of biofilm. (Lijuan Zhao, Li Lu et al, 2020)

Agriculture 4.0 is revolutionising farming lives owing to the development and acceptance of previously utilised in other productive sectors technology such as artificial intelligence, the Internet of Things, and robots. Due to the necessity to fulfil cleanliness and manipulation criteria in unstructured settings and in operation with fragile items, soft robotics and soft grippers in particular are potential ways to lead to innovative solutions in this industry. The goal of this review is to take a closer look at soft end-effectors for agricultural applications, with a focus on robotic harvesting. (Blanco-Canqui, H., & Lal, R. (2007). To that aim, the current status of automatic picking chores for a variety of crops is examined, with the goal of determining which tasks lack automated solutions and which approaches are most widely utilised based on the botanical features of the fruits. The most recent developments in the design and implementation of soft grippers are also given and addressed, with an emphasis on material qualities, manufacturing processes, gripping technologies, and proposed control approaches. (Basnet, C. B., Foulds, L. R., & Wilson, J. M. (2006).

1.4 Crop Harvesting Improvement

Over the years people are still using the traditional way in harvesting their crops that used so many times and many people to get it done fast. Machines and aggregates that execute a single operation are frequently employed in soil preparation for planting crops; their many runs across the surface of the field being treated raise energy costs, cause soil compaction, and lead to the formation and development of erosion processes. In light of this, it is necessary to develop cultivation methods, machinery, and units for soil preparation and crop planting. (Apazhev, A. K., et al. 2019.) Engineers are researching automation as a technique to cut costs and improve quality in greenhouses dedicated to fruit and vegetable production (see 'Ripe for the picking'). Robotic pickers and devices to monitor vegetable development are now being tested. Sensing technology ('Animal trackers') can assist livestock producers in managing the health and wellbeing of their animals. In addition, work is undertaken to enhance soil quality monitoring and management ('Silicon Saviorsours) and disease without resorting to indiscriminate agricultural usage ('Eliminating foes'). (King, Anthony. 2017)

Precision agriculture can streamline cantering and processing. It enables management to make rapid choices. Fertilizer applicator for tree crops that is fully automated. The system is made up of an input module that collects real-time sensor data, a decision module that calculates the best fertilizer, and NDA tribution pattern fertilizer output that controls the fertilizer application rate. (Banu, S. 2015) The usage of sensors and associated networks has yielded several benefits. Choosing sensors and putting them to good use to address difficulties in the agricultural area (Abbasi, Abu Zafar, Noman Islam, and Zubair Ahmed Shaikh. (2014)) Greenhouse technology in agriculture is moving in the direction of automation and information technology, because of the fast development and widespread application IOT (internet of things) technology. Based on the current state of agricultural production, the article investigates the integration of control and information networks using IoT technologies. It is proposed to use a remote monitoring system that combines internet and wireless communications. At the same time, an information management system is built, taking into consideration the system. The collected data by the system provided for agricultural research facilities. (Zhao, Ji-chun, et al. 2018)

1.5 Problem Statement

The researcher saw many farmers in Malaysia, especially in Sabah took a long time to harvest and their crop production is in slow progress due to many problems and limitations. Therefore, the researcher saw that farmers in Sabah mostly did not have the knowledge about agrotechnology or agricultural technologies that make farmer's yield or crop production slow. Researchers also saw that farmers in Malaysia are not familiar with farming technologies today, making their knowledge about farming limited to the traditional way or conventional way. Finally, the researcher acknowledges that farmer's do not know the benefits of implementing technology in farming.

1.6 Research Questions

1. Is there a significant relationship between benefits of agrotechnology implementation and crop harvesting improvement?
2. Is there a correlation between benefits of agrotechnology implementation and variables?
3. What is the most dominant among the existing variable for the crops harvesting improvement?

1.7 Research Objectives

1. To analyse the significant relationship between benefits of agrotechnology implementation and crop harvesting improvement
2. To examine the correlation between benefits of agrotechnology implementation and variables.
3. To verify what is the most dominant among the existing variable for the crops harvesting improvement.

1.8 Significant of Study

The aim of this study is to investigate the effective agrotechnology implementation toward crop harvesting improvement in Sabah. Therefore, this study expected to introduce about the benefits of agrotechnology implementation to people in Sabah that focused in Kudat district. Researcher also expect that people will more interested to start their farming activities and could focus to commercialize their crop after harvested.

1.9 Scope of Study

The researcher's scope of the study is among farmers and people to know about their opinion about agrotechnology to be implemented in farming activities. Due to the researcher's transport difficulty and limitation to reach people the researcher will use the google form to gain respondents along with this research. The google form will be distributed using social media such as WhatsApp and Facebook as the researcher's main platform to reach people.

CHAPTER 2

Literature Review

2.1 Introduction

This chapter will be focused on the study's independent variables and dependent variables. The data for both variables are taken from literature reviews, books that are related such as relevant articles also included especially related agrotechnology. After doing some studies on theories and models there are only several arguments from the articles were selected. Therefore, researcher used quantitative methods and utilized the same method to decide on research questionaries for survey purposes. Finally, all inputs will be transformed into a theoretical framework which here will relate to chapter 3. The ideas presented should indeed be founded on references and variable connections.

2.2 Effective Agrotechnology Implementation

The latest advances in Smart Farming, which already proven that the best system is implemented for everyone because of the benefits that users will get and the return on investment that they will obtain. Agrotechnology or smart farming that uses the latest techno, for example, drones, timer, and camera for inspection purposes. which make use of IoT, are slowly but steadily changing the face of traditional agriculture only by making them more effective for farmers, but also by decreasing crop waste. The goal is to develop a solution that

can send out notifications to farmers via various channels. Farmers will benefit from the device since it will provide them with real-time data (temperature, humidity, soil moisture, UV index, and IR) from their field, allowing them to take the required actions to increase crop yields while minimizing waste (water, fertilizers) (Doshi, Jash, Tirthkumar Patel, and Santosh kumKumararti 2019). Smart farming also gives a shorter time to harvest than the conventional method "Even though I'm still experimenting with this (smart farming) system, I'm proud to say that it has helped me to save time and manpower costs and has given me better yields too," he added. (New Sarawak Tribune, 2020) this is because the fertilizers that they use are automatically managed and suitable for the age of the plants needed. This study has 3 independent variables for the benefits of agrotechnology which are easy labor, IoT, and good management.

2.2.1 Make Job Easier

Labor means the number of work, physical, and social efforts required to create commodities and services in a given economy is referred to as labor. It provides the knowledge, labor, and customer service required to transform raw resources into completed goods and services (Kimberly Amadeo, 2021). Agrotechnology is an agriculture method that easy labor means having less work and the work that can be done by a small number of people and gives a big amount of return. Easy labor is important because much work can be done by the farmer and does not need to have many workforces to accomplish the work. Therefore, easy labor has three variables which are easy watering, quick analysis, and healthier yields.

2.2.1.1 Improved Watering System

Agrotechnology allows the farmer to provide water to plants automatically. With automatic watering irrigation systems, the farmer can do timely irrigation which means the plants can be watered when needed at the time and duration that has been set up. Automatic watering has accurate cut-off water compared to manual checking. (AgricultureVictoria, 2022). Therefore, it is important to improved watering system simplifies farming activities.

2.2.1.2 Continuous Feedback

The advances in information and communication technologies (ICT) and their application in agriculture have discovered the way for the emergence of Digital Agriculture, which has developed new methods for attempting to make agriculture more effective, quick, and easy to control while also being environmentally friendly. (M.-Tahar Kechadi, Michael Mcdonnell, 2020). Agrotechnology, gaining information on soil fertility, temperature, water contains, fertilizers, etc. all of these data are gathered using high positioning systems, smart sensors, and a range of computer applications combined with high-tech engineering. This will give farmers advantages in making better decisions. Hence, continuous feedback about crops condition provides relevant information for better operations.

2.2.1.3 Machineries Utilization

A machinery is a mechanical system that uses power to add forces and regulate movement to complete a task. Machinery today also involves artificial intelligence (AI) to make it easier to control even at a greater distance as long as there is an internet connection. Examples of technology and machinery in farming are automation harvesting, autonomous tractors, seeding machines, weeding machines, and drones. The benefits that farmers can get through the implementation of these technologies and machines are neat and fast and less working labor cost. Examples of works that can be done using machines and technologies are fruit picking, pesticides, and planting. Therefore, machineries (Equipment) utilization increases jobs speed.

2.2.2 Internet of Things (IoT)

The Internet of Things (IoT), often known as the Internet of Anything or the Industrial Internet, is a new technological paradigm that envisions a worldwide network of interconnected equipment and gadgets. The Internet of things is widely considered one of the most essential areas of future technology, and it is attracting significant interest from a variety of businesses. (Lee, I., & Lee, K. (2015). Examples of IoT in farming are agricultural drones, livestock tracking, smart greenhouses, and predictive analytics for smart farming. (IoT solutions world congress, 2022) Sensors, control systems, robots, autonomous vehicles, automated hardware, variable rate technologies, motion detectors, button cameras, and wearable gadgets are all