



ADOPTION OF AGRICULTURAL INNOVATION AND TECHNOLOGY

FOR SUSTAINABLE PALM OIL INDUSTRY IN MELAKA



Bachelor of Technology Management with Honours (Technology Innovation)

Final Year Project

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UNIVERSITI TEKNIKAL MALAYSIA MELAKA

**ADOPTION OF AGRICULTURAL INNOVATION AND TECHNOLOGY
FOR SUSTAINABLE PALM OIL INDUSTRY IN MELAKA**

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**This thesis is submitted in partial fulfilment of the requirements for the award
of Bachelor of Technology Management and Technopreneuship
(Honours in Technology Innovation)**



**Faculty of Technology Management and Technopreneuship Universiti Teknikal
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FEBRUARY 2023

APPROVAL

“I hereby declare that I had read and go through for this thesis and it is adequate in terms of scope and quality which fulfil the requirements for the awards Bachelor of Technology Management (Technology Innovation) with Honours”



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DECLARATION OF ORIGINAL WORK

I hereby declare that this thesis with the title

**“ADOPTION OF AGRICULTURAL INNOVATION AND TECHNOLOGY
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is the result with my own research except as the cited in references.

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Date: 5 February 2023



DEDICATION

I would want to express my gratitude to my family and friends, who were always encouraging and supportive as I worked on the research. In addition, my supervisor, Puan Nor Ratna Binti Masrom, and panel, Ts. Dr. Nurulizwa Binti Abdul Rashid, supervised my research, and course mates assisted me in completing the research path.



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ABSTRACT

Agriculture is an industry that contributes to the economic growth and social progress of many countries worldwide, as well as has positive impacts on the environment. However, the agricultural industry also faces many challenges, such as the quality of crops and land available for farming activities, climate change, poor economic conditions for farmers, and lack of technology. This study examined the behavioural intention to use agricultural innovation and technologies from the perspective of farmers using the Unified Theory of Acceptance and Use of Technology (UTAUT). This study contributes to the theoretical understanding of applying UTAUT to examine the behavioural intention to adopt agricultural innovation and technologies among farmers. In this study, the data findings were collected through interview sessions with five people consisting of farmers and workers from Sime Darby who are directly involved in the palm oil industry. The implementation of technology in the oil palm industry not only increases productivity but also significantly reduces the cost of plantation management. The results show that the acceptance of mechanization technology among farmers and workers in oil palm plantations is the main concern behind not using technology in production and processes. This is because there are many technologies that can be used in the agricultural sector to ease manual labour with reduced cost. Qualitative research has been conducted to address the problems faced by the authority of Palm oil plantations. The increasing rate of technological advancement across various disciplines, and in particular the agricultural sector, has resulted in increased efficiency and productivity. The findings of this research contribute to the sustainable palm oil industry in Melaka and to the Melaka State Food Industry Domestically and Abroad from the year 2022 to 2030.

Keywords: The Unified Theory of Acceptance and Use of Technology (UTAUT), Mechanization Technology, Behavioral Intention

ABSTRAK

Pertanian ialah industri yang menyumbang kepada pertumbuhan ekonomi dan kemajuan sosial banyak negara di seluruh dunia, serta mempunyai kesan positif terhadap alam sekitar. Walau bagaimanapun, industri pertanian juga menghadapi banyak cabaran, seperti kualiti tanaman dan tanah yang tersedia untuk aktiviti pertanian, perubahan iklim, keadaan ekonomi petani yang lemah, dan kekurangan teknologi. Kajian ini mengkaji niat tingkah laku untuk menggunakan inovasi dan teknologi pertanian dari perspektif petani menggunakan Teori Penerimaan dan Penggunaan Teknologi Bersepadu (UTAUT). Kajian ini menyumbang kepada pemahaman teori mengaplikasikan UTAUT untuk mengkaji niat tingkah laku untuk menerima pakai inovasi dan teknologi pertanian dalam kalangan petani. Dalam tinjauan ini, pengkaji telah menemubual seramai lima orang yang terdiri daripada petani dan pekerja dari Sime Darby yang terlibat secara langsung dalam industri kelapa sawit. Pelaksanaan teknologi dalam industri sawit bukan sahaja meningkatkan produktiviti tetapi juga mengurangkan kos pengurusan perladangan dengan ketara. Keputusan menunjukkan penerimaan teknologi mekanisasi di kalangan para petani dan pekerja di ladang kelapa sawit adalah kebimbangan utama di sebalik tidak menggunakan teknologi dalam pengeluaran dan proses. Hal ini kerana, terdapat banyak teknologi yang boleh digunakan dalam sektor pertanian untuk memudahkan kerja manual dengan pengurangan kos. Kajian kualitatif telah dijalankan untuk menangani masalah yang dihadapi oleh para petani pihak berkuasa ladang kelapa sawit. Peningkatan kadar kemajuan teknologi merentasi pelbagai disiplin, khususnya sektor pertanian, telah menghasilkan peningkatan kecekapan dan produktiviti. Penemuan penyelidikan ini menyumbang kepada industri kelapa sawit lestari di Melaka dan kepada Industri Makanan Negeri Melaka Di Dalam dan Luar Negara dari tahun 2022 hingga 2030.

Kata kunci: Teori Penerimaan dan Penggunaan Teknologi Bersepadu (UTAUT), Teknologi Mekanisasi, Niat Tingkah Laku

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LIST OF ABBREVIATIONS

UTeM	Universiti Teknikal Malaysia Melaka
FFB	Fresh Fruit Bunches
UTAUT	Unified Theory of Acceptance and Use of Technology
GDP	Growth Domestic Product
MPOB	Malaysian Palm Oil Board
NGOs	non-governmental organizations
MSPO	Malaysian Sustainable Palm Oil
FAO	Food and Agriculture Organization (FAO),
PORIMP	Palm Oil Research Institute of Malaysia (PORIMP),
MPOC	Malaysian Palm Oil Council (MPOC)
FELDA	Federal Land Development Agency (FELDA),
FELCRA	Federal Land Consolidation and Rehabilitation Authority (FELCRA)
PC	Performance Expectancy
EE	Effort Expectancy
SI	Social Influence
FC	Facilitating Condition
BI	Behavioral Intention
PC	Price Value

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CHAPTER 1

1.1 Introduction

The purpose of this chapter is to explore the factors influencing behavioral intention to Technology in Palm Oil Industry in Melaka. This chapter will also cover the research background, problem statement, research questions, research objectives, research scope, significance of study, limitations of study, and operational definition.

1.2 Background of Study

Agricultural activities range from planting crops (agriculture), timber to raising livestock for household consumption or economic purposes. The agricultural sector performs a crucial role in ensuring the availability of food and achieving food security (Pawlak & Kołodziejczak, 2020). Improved food supply through increased agricultural productivity and expansion of agricultural land use appears to be a viable method of alleviating hunger (Pawlak & Kołodziejczak, 2020). Also, agriculture is a source of income for a significant portion of the world's population and nations. In the case of Malaysia, agriculture contributed 7.1% of the country's GDP (RM101.5 billion) and provided 16% of the workforce with employment. Agriculture is the third largest contributor after services (57.7%) and manufacturing (22.3%) (DOSM, 2019).

As Malaysia is one of the major oil consumers in the world, the sustainability of palm oil has been controversial. Several sustainability standards are introduced to ensure the balance performance in terms of economic, environmental, and social performance of the industry. Nonetheless, the social aspect of the sustainability of palm oil has received relatively less emphasis as compared with the economic and environmental aspects. Oil palm is the major agriculture product in Malaysia which covers up to 5 million hectares of Malaysia's land. High demand for oil palm product has encouraged researchers to study possible ways to increase the productivity of the oil palm yield production. Oil palm can produce two types of oil which are palm oil and palm kernel oil.

Palm oil is the oil extracted from the flesh of oil palm FFB, whereas palm kernel oil is the oil extracted from the seed of the oil palm fruitlet. Oil palm products such as vegetable oil, cosmetic, pharmaceutical and biofuel are important in our daily life. Today's fast progressing technology represents a totality of the ways by which innovations provide the means to enrich and ease human living. The application of the technology would have begun with simple tools crafted as aids for everyday convenience. From there, innovation takes technology to a level that now pervades all aspects of human activity. The technological developments have given rise to a new generation or even a new civilization, and have engulfed all aspects of community life.

In Malaysia, much agricultural activity today revolves around the use of modern technology to attain the desired output. Among examples of such agricultural technology are modern machinery, chemical fertilizers, and equipment to produce improved seed stock and planting materials. Technology is today recognized as a strategic element in raising the competitiveness of a country's economy. This is undoubtedly true of the palm oil industry where modern technology plays a crucial role in aiding industry workers as they perform their duties.

The relevant technologies in the palm oil industry are varied, and they include planting materials, field machinery, fertilizers, factory equipment, and so forth. Technology is the result of man's ingenuity that facilitates and simplifies his activities. Especially in this era of globalization, technology cannot be divorced from everyday life, with its ubiquity reflecting our day-to-day living dependency on it. Palm oil Board (MPOB), Malaysian Palm Oil Council (MPOC), Forest Research Institute Malaysia (FRIM), Palm Oil Research Institute of Malaysia (PORIMP), land settlement schemes such as Federal Land Development Agency (FELDA), Federal Land Consolidation and Rehabilitation Authority (FELCRA) and Rubber Industry Smallholders Development Authority (RISDA), private sector participation and contributions from academicians in some local universities.

Additionally, the strategic economic plans of the government which continues to set feasible target for the oil palm industry also immensely contributed to the development of the sector. Research and development have been an integral part of the growth of the Malaysia oil palm industry with greater focus on innovation and technologie

1.3 Problem Statement

In 1870, oil palm was founded as an ornamental plant in Malaysia before being marketed at Tennamaram Estate, Selangor, in 1917 (Nambiappan et al., 2018). Naturally, palm oil is known as the most profitable industrial production. In the early 1960s, palm oil production grew quickly. Due to that, palm oil has been a significant subsection of Malaysia's economy, adding 37.9% of the agricultural industry to domestic product development (Department of Statistics Malaysia, 2019). However, in recent years, there has been increasing concern about sustainability issues related to palm oil production. Advocates argue that the palm oil industry has caused deforestation, which leads to biodiversity loss, increased soil erosion, and loss of wildlife habitat. The global resolution of the palm oil industry has established the palm oil industry in Malaysia as one of the biggest contributors to domestic product growth in the world (Balu et al., 2018). Malaysia is currently the second-largest palm oil producer and exporter after Indonesia (Kushairi et al., 2019). Approximately 20 million tons of crude palm oil is produced annually.

Oil palm production, especially large-scale estates, has frequently been associated with negative social impacts on rural communities, indigenous people, and estate laborers. The employment of undocumented labor and children exposes them to exploitation and violates human rights (Ferdous Alam et al., 2015; Pye, 2018). Lack of access to school education and training in the workplace and poor working conditions are also asserted as neglecting the welfare and well-being of plantation workers.

Consequently, many non-governmental organizations (NGOs) have launched a series of anti-palm oil campaigns in order to increase the awareness of the social sustainability issues associated with palm oil production (Goh, 2016). These global anti-palm oil campaigns have created a strong impact on the demand for crude palm oil, particularly in developed nations such as European Union nations. The Malaysian government has been actively defending the sustainability of the industry through the enforcement of sustainability certification across the whole palm oil production chain, organizing awareness campaigns and branding activities.

Despite being the top producing crops, the subsector for palm oil encounters several difficulties. The difficulties including lower production of palm oil, lower exports, greater demand for palm oil and lower prices of palm oil (Kushairi et al., 2019). Besides that, the rise and fall of commodities price influence the performance of the subsector of the palm oil (Songsingchai et al., 2020). Malaysia is currently suffered poor returns in agricultural production and the stagnant commodity prices were escalating.

Learning less about the price trend would impact the economy as a whole, as Malaysia still depends on these resources to expand economically. Some researchers (Baruník & Malinska, 2016; Alameer et al., 2019) had reported that understanding the price trend in advance would support the interest group in decisions making (buying or selling). In this scenario, the government should create a countermeasure if the drop in the commodity price is inevitable. Since this has become a major problem that needs to be tackled, therefore, it is.

Malaysia's region planted with oil palms has seen a substantial increase by the independent smallholder sector. In Peninsular Malaysia, a significant number of independent smallholders had 175,630 of them (MPOB,2017), with a total planted area of 538,490 hectares in 2017 (Azman et al., 2018). A large number of smallholders leave a significant impact on the national economy as numbers of registered smallholders reported gaining lower yields than large-scale plantations.

The indicated that palm oil smallholders are still in complexity in terms of best farm management practices, acquisition of new technologies, lack of financial resources and income as well as the financial ability to purchase high-quality fertilizers. Moreover, since the majority of smallholders come from a poorly educated background, this has caused them to have lack of technology awareness that can aid them in performing plantation operation activities as reported by Awang et al., (2016), smallholder cultivators commonly lived in a rural area with low internet coverage and current technology availability.

1.4 Research Questions

The following research question is being addressed in this study:

- 1.4.1 What is the palm oil industry in Melaka?
- 1.4.2 What are the factors influencing behavioral intention to use technology in Palm Oil Industry in Melaka?
- 1.4.3 What is the model of acceptance technology use in palm oil industry in Melaka?

1.5 Research Objectives

The research's objective was to determine adoption of agricultural innovation and technology for sustainable palm oil industry in Melaka. The following are the research objectives:

- 1.5.1 To describe palm oil industry in Melaka.
- 1.5.2 To investigate the factors influencing behavioral intention to use technology in Palm Oil Industry in Melaka.
- 1.5.3 To identify model of acceptance technology use in palm oil industry in Melaka.

1.6 Scope of Research

The research's scope is the distribution of interview session which is to analyze the factors influencing. The respondents will be a farmer who are in areas Melaka. This study focuses on farmers who are still in practices of adoption technology in their farming or new-entry in adopt the technology of farming.

This research will focus on studying the factors influencing behavioral intention to Technology in Palm Oil Industry. This research will cover types of technology that has been used in palm oil industry as examples, e use of a motorized harvesting pole, Cantas™, to improve harvesting productivity, a diamond sharpening tool, and the use of buffalo-assisted collection of FFB. This research will focus on observing and understanding whether effort expectancy, performance expectancy and perceived risk moderate that will predict behavioral intention to use technology in palm oil industry. Moreover, qualitative studies could elucidate and justify in detail how the model UTAUT can influenced the use of technology in palm oil industry.

1.7 Theoretical Contribution

Firstly, Rogers's theory of innovation diffusion provides a foundation understanding of adoption theories. Rogers's theory has been used broadly across disciplines to comprehend and predict change. Although Rogers's theory is a critical foundation, it is not always easily applied to understanding adoption. Although several research studies seek to understand adoption process, only a few theories are widely used in the current literature. The theory will be used in this research is Universal Technology Adoption and Use Theory (UTAUT). UTAUT are originally based out of computer science specifically to answer questions about technology adoption. There is no one model for understanding the processes in which an individual engages before adopting a new innovation. Historically, adoption is understood in terms of some kind of behavior change.

1.8 Limitation of Study

This study is constrained by a limited number of respondents, time constraints, and the honesty of respondents. This study is limited to the farmers who are in industry palm oil. In addition, the researcher will have just twelve weeks to gather data. While one of the constraints was the respondent's honesty while answering the interview questions about their expertise or understanding of the adoption of agricultural innovation and technology for sustainable palm oil industry.

1.9 Chapter Summary

Finally, this chapter completed the research's background, which is connected to the present status of Palm Oil Industry in Malaysia. There are also statements regarding why this research is being conducted. In addition, three research questions and objectives have been presented in this chapter. The purpose of this research is to investigate the factors influencing behavioral intention to Technology in Palm Oil Industry in Melaka. There are various limitations to doing this study, such as a restricted number of respondents, time limits, a limited geographic area, and respondent honesty. The importance of this study is that it provides information on UTAUT model which are effort expectancy, performance expectancy, social influence, and facilitate condition and predict behavioral intention to use Technology in Palm Oil Industry.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

In this chapter, the literature and previous research presented in this chapter provides further information on factors influences behavioral intention, sustainability of palm oil industry, agricultural innovation and technology in palm oil industry, factors of acceptance and adoption of technology, theoretical background (UTAUT). The information of this section will help to contextualize the research question. At the end of this chapter, summary was made and use as framework of the study.

2.2 Sustainability of Palm Oil Industry

The sustainability of the palm oil industry has been under the spotlight in recent years. At one end, palm oil is the most versatile oil which serves as a key ingredient for a variety of products, ranging from food, to cosmetic, natural preservatives, cooking oil, as well as biofuel. Palm oil remains a dominant player in the total oils and fats market, contributing to about 36.43% of the global consumption, followed by soybean oil (27.75%) and rapeseed (canola) oil (13.56%) (Shahbandeh, 2020). On the other end, the palm oil industry is claimed to be one of the major drivers of deforestation and loss of biodiversity. Furthermore, the agricultural practices in oil palm plantations are also believed to contribute to soil erosion, water pollution, as well as haze issues associated with the burning of peatlands (Bissonnette, 2016).

Lack of standard procedure and documentation on the employment in oil palm plantations, particularly those involving native and indigenous groups are often associated with labor and human rights issues. Despite studies in major palm oil-producing countries (Indonesia, Malaysia, Brazil) have shown that the palm oil industry is positively correlated to income and financial security of the smallholders, particularly on job creation, economic activities and infrastructure development to improve the overall quality of life, the negative impacts of the industry are still significant and shall be mitigated (Bissonnette, 2016; Azima et al., 2018; Córdoba et al., 2019).