UNIVERSITI TEKNIKAL MALAYSIA MELAKA

THE EFFECTIVENESS OF SMART FARMING IN MALAYSIA AGRICULTURE SECTOR

HAZIRA BINTI ZOLL

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

FACULTY OF TECHNOLOGY MANAGEMENT AND TECHNOPRENEURSHIP

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

2023

I

SUPERVISOR AND PANEL DECLARATION/APPROVAL

"I/We hereby declared that I/We had read

this thesis and this thesis are adequate in terms of

scope and quality which fulfil the requirement for the award of

Bachelor of Technology Management with Honors (Technology Innovation)."

Signature   :

Supervisor   : DR ATIRAH BINTI SUFIAN

Date   : 2/2/2023

Signature   :

Panel   : MISS ATIKAH SAADAH BINTI SELAMAT

Date   : 02/02/2023

DECLARATION OF ORIGINAL WORKS

"I hereby admit that this is my own work
except for summary of except of which I had
mentioned the source."

Signature   :

Name   : HAZIRA BINTI ZOLL

Date   : 15/01/2023

DEDICATION

Every challenging job requires self -effort and guidance

as well as strength from Allah SWT as well as parents. My humble efforts

I dedicate to: Allah SWT, respected lecturers, mothers, friends, and seniors

who provided guidance, strength, and skills to the researcher in completing this thesis.

ACKNOWLEDGMENT

First of all, I would like to express my gratitude to Allah SWT who has given me the strength and ability to complete this final year project successfully. Most importantly, I would like to express my sincere appreciation and thanks to my supervisor Dr Atirah Binti Sufian for her support in making this work a success. The guidance and advice really helped me through all the stages of writing my project. I would also like to thank my panel for all the advice to improve my thesis and give me useful knowledge and information throughout this journey.

I also want to publicly express my gratitude to my parents, who have always and forever prayed for me and my family's happiness and prosperity in this life and the next. My motivation to do well in school comes from knowing that my parents are cheering me on from above. Also, I'd want to say thanks to siblings for being the first to pitch in when I'm in need and constantly concerned about my well-being and financial stability.

I'd also want to thank my buddy Rahah Binti Rosdi, who has always been supportive and helpful in making our final year project a success. Similarly, Anas Luqman Bin Aziz, who constantly attempted to amuse me and provide a safe haven for me to vent my sentiments when I was almost despondent. Thank you for being patient with me.

Finally, I'd want to express my gratitude to myself. I want to praise me for having faith in myself. I'd want to thank for all of efforts so far. I'd want to thank for enduring and trying despite the hundreds of difficulties that have befallen me. I want to praise myself for never giving up on all of this.

ABSTRACT

"The Effectiveness of Smart Farming in Malaysia agriculture sector" has contributed to improving the quality and quantity of the country's agriculture in addition to the use of advanced new technology. The dominant explanation for this trend is the use of Smart Farming in agriculture with the independent factors of performance expectations, effort expectations, social influence and facility conditions. Previous studies have used the UTAUT Theory in this research related to agriculture, therefore the researcher also used it as a guide in completing this research. The researcher uses data from SPSS which is the result of descriptive analysis and reliability analysis to explain the correlation between the four factors and the adoption of Smart Farming. The effectiveness of Smart Farming can be recognized in terms of increasing firm production, revenue, and reducing expenses in the agricultural industry. Our findings indicate that the adoption of Smart Farming cannot be explained by hypotheses centered on social influence and facilitation condition, and they show where in this process inequality is generated and where it is not.
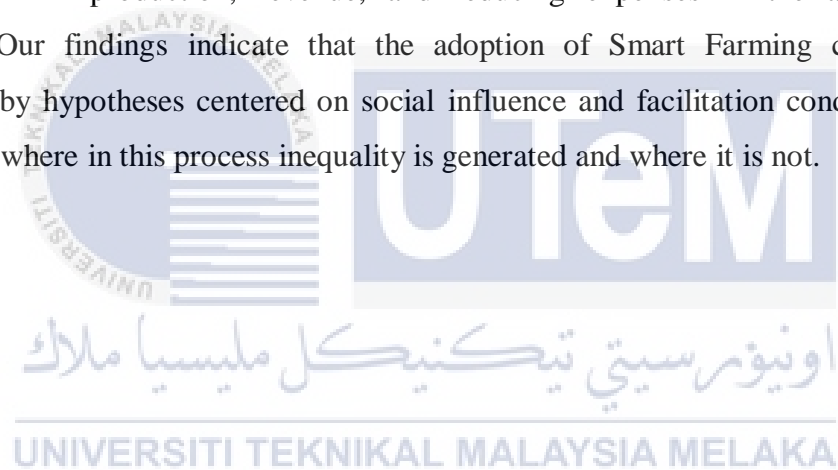
ABSTRAK

"Keberkesanan Pertanian Pintar di sektor pertanian dalam Malaysia" telah menyumbang kepada peningkatan kualiti dan kuantiti pertanian negara di samping penggunaan teknologi baharu yang canggih. Penjelasan dominan untuk trend ini ialah penggunaan Smart Farming dalam pertanian dengan faktor bebas jangkaan prestasi, jangkaan usaha, pengaruh sosial dan keadaan kemudahan. Kajian terdahulu telah menggunakan Teori UTAUT dalam penyelidikan berkaitan pertanian ini, justeru pengkaji turut menjadikannya sebagai panduan dalam menyiapkan penyelidikan ini. Pengkaji menggunakan data daripada SPSS yang merupakan hasil analisis deskriptif dan analisis kebolehpercayaan untuk menjelaskan perkaitan antara empat faktor dengan penggunaan Smart Farming. Keberkesanan Smart Farming boleh diiktiraf dari segi meningkatkan pengeluaran firma, hasil, dan mengurangkan perbelanjaan dalam industri pertanian. Penemuan kami menunjukkan bahawa penggunaan Perladangan Pintar tidak dapat dijelaskan oleh hipotesis yang berpusat pada pengaruh sosial dan keadaan fasilitasi, dan ia menunjukkan di mana dalam proses ini ketidaksamaan dijana dan di mana ia tidak..

TABLE OF CONTENT

THE EFFECTIVENESS OF SMART FARMING IN MALAYSIA AGRICULTURE SECTOR

CHAPTER 1

1.0 INTRODUCTION

1.1 BACKGROUND OF STUDY

Farming in basic terms is the cultivation of food, crops, and animals. Agriculture has been considered an art for centuries, since it involves skill and devotion. Farming is essential to the survival of all life on earth, and the output of farming is directly related to human consumption. Agriculture has been the source of both raw and finished commodities, ranging from industrially produced goods to field-grown produce. Farming is essential not just for human survival, but also for the preservation of the planet's biodiversity. It has provided individuals with economic opportunities and physical activities. (Bhanu Garg, 2019). These goods, as well as the farming practises used, may differ from one region to the next. Agriculture's expansion has aided the emergence of civilizations throughout the millennia. People used to spend the majority of their time hunting wild animals and harvesting wild vegetation before agriculture became widely available. People began to learn how to cultivate grain and root crops about 11,500 years ago, and they eventually settled down to a farming lifestyle (Poovenraj Kanagaraj, 2021). Agriculture has been the main source of income for most of the world's inhabitants by 2,000 years ago.

Smart Farm (SF) refers to the incorporation of information and communication technology into agricultural equipment and sensors for use in crop growing and food production. Internet of Things (IoT) and different electronic instruments (robots and artificial intelligence) with data transformation and signalling facilities worlds, such as smart homes, smart health care, and now the agricultural sector, are prevalent in the current period of sophisticated technology. Currently, farmers may use IoT to increase

farm efficiency, such as irrigation, fertiliser, harvesting data, and climate forecasting, by monitoring using sensors to improve decision making (Tisserye, 2015). This innovation helps farmers to make more informed choices on the management of their farms by maximising the use of available resources, hence increasing productivity and profitability.

The research of Schumpeter (A. Kaloxylos, 2016), which highlighted the core of economic growth in connection to innovation, has sparked one of the debates regarding new technologies. Technological innovation alters production patterns and may differentiate between regional and national economic growth (J.A. Schumpeter, 2019). The inclusion of automation and chemistry into the agriculture sector has resulted in significant structural changes. This is an example of a technological-economic paradigm that has had a broad impact on the economy. The current application of the internet of things in smart settings, as well as cloud computing, may represent a new technological and economic paradigm (M. Hoffmann, 2014). However, in order to transform the techno-economic paradigm, all of the flaws and problems must be successfully solved in order to witness the efficacy and get fatmaatnya in the future.

1.2 PROBLEM STATEMENT

Smart farming is an example of how current communication technologies are being used in agriculture to bring about the third green revolution. With Internet of Things (IoT), Big Data, and sensor technologies, the third green revolution will give agriculture a new dimension. A lot of technical advancements in farming have occurred during the last several decades, making the practise more industrialised and technology-driven. Even the planting and watering of crops may benefit from technology improvements in agriculture. Automation and the Internet of Things (IoT) will have a huge impact on agriculture, allowing farmers to achieve more with less work. This is what's fueling the growth of Smart Farming technologies, in my opinion. The term "smart farming" refers to the use of technology such as IoT, robots, drones, and AI to raise the quantity and quality of goods while reducing the amount of human labour necessary for the production process (Robert,

2

2019). As Smart Agricultural technology advances, the Internet of Things (IoT) is becoming a more important part of the farming process.

However, building a smart agriculture system may not be as easy as just deploying a couple of sensors in the field. Though there are several benefits linked with precision agriculture, it also presents certain challenges to farmers and agribusiness owners that need to be overcome to ensure greater efficiency and maximum profitability. As technology advances and big data and the Internet of Things become more important parts of agricultural operations, having a reliable and consistent internet connection has become a typical difficulty, particularly in rural areas. To operate effectively and interpret gathered data, most precision agricultural procedures need stable internet access — 4G or higher. The adoption of digital technologies will be hampered by a lack of strong connection, as well as poor network performance and bandwidth speeds, which will slow the emergence of smart farming and food production (Admin, 2021).

Eventhough there are numerous research in this domain, there are still some unanswer question. First, there is no investigation into the relationship between the costs used in the implementation of this new technology between Smart Farming. Many major farm owners believe that implementing Smart Farming in this industry would be prohibitively expensive before doing any additional research (Aurell.G, 2018). While the initial costs of Smart Farming are considerable, they are very cost-effective in the long run. As a result, the cost of paying labour costs may also be decreased by simply relying on modern technology to produce huge amounts of high-quality crops.

Second, the link between Smart Farming and communities that undervalued modern technology was not investigated (Elvin, 2019). Having employed the same agricultural practices for decades, the people in the area have become used to them and are less interested in experimenting with new ones. It is possible for certain cultures to produce higher-quality crops via traditional plant cultivation than with the use of technology since they may inspect each plant one at a time for its quality and condition. They don't know that employing technology to cultivate plants results in higher-quality

crops (Rine, 2017). As a result, each Smart Farming technology is capable of not only watering and fertilizing, but also analyzing the pH rate and quality of seedlings that have been sown.

For the record, there has been no inquiry into the connection between Smart Farming and the more in-depth disclosures by those in charge. Promote Smart Farming equipment in supermarkets, highlight the necessity of using cutting-edge technology in agriculture, and provide public classes on how to use them to guarantee that the public is aware of a new technology and responds positively to it.

Therefore, it is necessary to better understand the short -term and long -term importance of Smart Agriculture to human life. This study will help identify the advantages of Smart Faming in the agricultural sector. This study will also explore the extent of the effectiveness of Smart Plantation in the Malaysian agricultural sector if it can be implemented successfull.

1.3 RESEACH OBJECTIVE

The effectiveness of Smart farming on agriculture in Malaysia is studied with several objectives. There are three objectives created to achieve the main goals of research:

1. To identify the factors impacting the adoption of Smart Farming.
2. To investigate the most significat factors of Smart Farming.

1.4 RESEACH QUESTION

The following research questions may be derived from the aforementioned research objective:

1. What are the factors impacting the adoption of Smart Farming.
2. What are the most significat factors of Smart Farming

1.5 SCOPE OF STUDY

The scope of the study defines the extent to which the research topic will be investigated and the limits within which the investigation will operate. Therefore, the purpose of this study is to find out the extent of the effectiveness of Smart Farming to the local community and the country in the next 10 years. Google form were the method chosen to conduct this study. Farmers who have been using Smart Farming in vegetable growing areas in the state of Malacca have been the focus of data collection. They are among those who can contribute to the country's economic progress by implementing innovative technologies.

Research will be conducted internally through selected locations and will involve organizations that practice Smart Farming technology in the local agriculture sector. There is some agricultural areas in Malaysia will be randomly selected using simple random sampling to contribute in this questionnaire session. The questionnaire will be conducted online to farmers and the general public who know a lot about this Smart Farming technology through an online google form survey. Finally, this analysis uses a case study to extend its findings. Because of the case studies, my research became more focused and manageable.

1.6 LIMITATION OF STUDY

There are various limitations to this study that prohibit researchers from accessing full and significant data. Limitations are flaws, circumstances, or forces outside of the researchers' control that constrain study technique and results (Baltimore Country Public School, 2014). In order to attain the aims described in the preceding paragraph, the interview survey method will be employed in this research. The time constraint was the first issue that arose throughout the research. Data collection from respondents is a time-consuming process. To acquire an accurate sample and restrict geographical coverage, the researcher spent almost a month to gather replies from the chosen respondents.

As a result, getting a complete target survey will take longer than intended. The time constraint also allows the study to collect as much data as possible from the respondents and determine the degree to which Smart Farming in Malaysia is beneficial to the local population. Another weakness of this research seems to be the correctness of the findings. This research does not cover every state in Malaysia due to time restrictions. These respondents were deemed to have delivered truthful and accurate responses in this survey.

1.7 SIGNIFICANT OF THE STUDY

The most significant aspect of this study is to identify creative behaviours among agricultural company personnel. The findings of this study may be utilised by other businesses or plantations to assist them rectify any inefficiencies that are hindering their efficiency. Many firms are able to find new behaviours among farmers in the agricultural industry by doing this study. It is critical for businesses to understand their workers' creative behaviour. It may assist businesses in continuing to develop in order to boost productivity. This research will benefit both students and companies as it will help them better understand the effectiveness of this Smart Farming technology to the development of the country. In addition to providing better knowledge on the triggering factors for the existence of this technology in the Malaysian agricultur sector.

As a result of this research, instructors will be better prepared to explain the pros and cons of this Smart Farming, as well as the impact on the organization if it is practiced on their own. It is expected that future researchers will benefit from this study as it will offer them some information they may need in their own research, as well as the opportunity to get some of their questions answered by the researchers involved in this study.

1.8 SUMMARY

This chapter will begin with the introduction and background of the study, followed by a description of the problem, the purpose of the study, and the research questions. The scope of the investigation and the limitations encountered while doing this research are also discussed. Finally, reeeit concludes with an important study that explains the contribution of this research. The literature review will be expanded in Chapter 2. In Malacca there have been several companies that practice Smart Farming technology that is easily seen by the public themselves, which is considered a quality standard in Malaysian agriculture. The majority of companies agree that it is mainly used to predict the increase of national income and systematically promote technology to employees, implement resource skill matrix, use existing workforce productively.

CHAPTER 2

2.0 LITERATURE REVIEW

2.1 INTRODUCTION

A literature review is a piece of academic writing that demonstrates knowledge and grasp of the academic literature on a particular subject in context. A literature review involves a critical assessment of the content, which is why it is termed a review rather than a report. Consider television or film review articles to demonstrate the distinction between reporting and reviewing. These articles offer information such as a short overview or major aspects of the film or show, as well as the critic's personal assessment. Similarly, the two major goals of a literature review are to summarise current research, hypotheses, and evidence, and then to critically evaluate and debate this information. A literature review is often included as a portion or component of a dissertation, research project, or lengthy article. It may, however, be assigned and graded as a separate piece of work.

2.2 DEFINITION

2.2.1 AGRICULTURE

Agriculture is made up of two Latin words: ager or agri, which means soil, and cultura, or Cultus, which means cultivation. Agriculture is an applied science that encompasses all aspects of crop production, including horticulture, livestock rearing, fisheries, and forestry, and is also defined as an art, science, and business of producing crops and livestock for economics, according to Rudd, James, Butson, Michael, Barnett, Lisa, Farrow, Damian, Berry, Jason, Borkoles, Erika, and Polman, Remco at 2016 in Agriculture Definition.

John R. Beard's work has been adapted in the Jurnal Agriculture stuff at 2019, it is frequently said that particular species of beetle, ant, and termite have been cultivating crops for 60 million years prior to human activities. It's defined in several ways, but at its broadest level, it's defined as the use of natural resources to "create commodities that support life, such as food, fibre, forest products, horticultural crops, and associated services." Arable farming, horticulture, animal husbandry, and forestry are all included purposes.

According to Osman Rahman's paper "Definition of Agriculture, Its Branches" from 2019, agriculture is divided into three branches: art, science, and commerce. It comprises knowledge of how to carry out farm activities in a skillful way, but not necessarily a grasp of the concepts behind agricultural practise, as it does in the realm of art. As a science, maximising outcomes and revenues by using all technologies established based on scientific concepts such as crop reproduction, production engineering, crop protection, economics, and so on. New crops and hybridised varieties, for example, transgenic plant varieties resistant to pests and diseases, deep hybrids per crop, highly sensitive fertiliser types, water management, weed control herbicides, and the use of biocontrol agents to battle pests and diseases, to name a few.

Definition as a company also defined by Khairul.N in the Agriculture in Malaysia at 2021, which is as long as agriculture constitutes the rural population's way of life, the end output is linked to consumption. Agriculture, on the other hand, as a company, seeks to maximise net return by managing land, water, and capital labour while using scientific knowledge to the production of food, feed, fibre, and fuel. Agriculture has been commercialised in recent years, with automation allowing it to be handled as a company.

2.2.2 SMART FARMING

Smart farming is a management concept focused on providing the agricultural industry with the infrastructure to leverage advanced technology – including big data, the cloud, and the internet of things (IoT) – for tracking, monitoring, automating, and analysing operations, according to Corinne Bernstein in the Smart Farming jurnal in 2019. Smart farming, often known as precision agriculture, is controlled by software and monitored by sensors. Smart farming is becoming more important as the world's population grows, as does the desire for greater agricultural yields, the need to conserve natural resources, the increased usage and complexity of information and communication technology, and the growing need for climate-smart agriculture.

According to the Cropin Website's Journal Smart Farmin Technologies, Smart Farming focuses on the utilisation of data obtained from multiple sources (historical, geographical, and instrumental) in the management of farm operations. It is not always the case that a technologically sophisticated system is a smart system. Smart agricultural technologies distinguish themselves by their capacity to collect and interpret data. Smart farming uses hardware (Internet of Things) and software (Software as a Service or SaaS) to collect data and provide actionable insights to manage all agricultural activities, both before and after harvest. The data is well-organized, always available, and chock-full of information on every facet of finance and field operations that can be accessed from anywhere in the globe.

2.2.3 UTAUT THEORY

A theory is a sort of logical abstract reasoning about a reality, or the outcomes of such thinking. Contemplative and rational thinking are often linked to procedures like observational inquiry or study. Theories might be scientific, non-scientific, or have no affiliation with any field. A theory's statements may contain

generic explanations of how nature works, for example, depending on the situation. Although the word's origins are in ancient Greek, it now has a variety of connotations in current use.

The word "theory" is used in contemporary science to refer to scientific theories, which are well-confirmed types of natural explanations developed using the scientific process and meeting modern science's standards. Such theories are formulated in such a manner that scientific testing should be able to offer empirical support (or falsify) for them. In contrast to other popular usage of the term "theory," which indicate that something is unverified or speculative, scientific theories are the most dependable, rigorous, and complete form of scientific knowledge. (which in formal terms is better characterised by the word hypothesis). In 2018, the Institute of Medicine of the National Academy of Sciences reported. Science, evolution, and creationism are all topics that are discussed in this article. Theories differ from hypotheses, which are individual empirically tested conjectures, and scientific laws, which are descriptive explanations of how nature operates under given situations, according to Washington.

Venkatesh and colleagues developed the notion of unified technology acceptance and usage (UTAUT) as a technology acceptance paradigm in "User acceptance of information technology: Towards a unified vision." UTAUT seeks to explain users' intents to utilise the information system and subsequent use patterns, according to Viswanath's essay from 2019. There are four key elements according to this theory: 1) performance expectations, 2) effort expectations, 3) social influence, and 4) enabling context.

This theory was created by reviewing and combining eight model constructs that have previously been used to explain information system use behaviour (reasoned action theory, technology acceptance model, motivation model, planned behaviour theory, combination of planned behaviour

theory./Acceptance model. technology, personal computer use models, innovation dissemination theory, and social cognitive theory). Venkatesh et al. (2018) showed that UTAUT accounted for 70% of the variation in Behavioral Intent for Usage (BI) and nearly 50% of the variance in actual use in a longitudinal study. Researchers employ the Utaut theory to finish the study of the agricultural sector Smart Farming.

2.3   FACTORS IMPACTING THE ADOPTION OF SMART FARMING IN AGRICULTURE MALAYSIA.

Adoption of technology refers to the acceptance, incorporation, and use of new technologies in society. Typically, the phases are defined by the categories of individuals who use the technology. In this research, behavioural intention evaluates the attitude of prospective Smart Farming users, with the relationship between the independent variables assumed to exist.

Approximately 8% of Malaysia's GDP comes from agriculture, fishery, and forestry, and they employ about 10% of the country's work force. About half of the production comes from palm oil, rubber, cocoa, and wood products, while other major contributions include tropical fruits and grains.Based on data from the International Trade Administration's website as of the year 2016, Malaysia is the second biggest palm oil production and exporter in the world, behind only Indonesia. By 2020, Malaysia's palm oil output will account for 26% of global production and 34% of global exports. The only way to boost national output of palm oil at this time is via increased yield and productivity, since no new land is available for cultivation.

In addition to their extensive presence in Indonesia, Malaysian palm oil firms have financed the construction of palm oil refineries in key consumer regions like the European Union, India, China, and the United States. The government of Malaysia has a majority stake in several of the country's biggest and most prosperous palm oil plantation businesses. As Malaysia is a large producer of crops, therefore the use of new

technologies needs to be expanded in order to improve the quality and quantity of crops in our country.

2.3.1 PERFORMANCE EXPECTANCY

Performance expectations related to the assessment of potential users about the level of use of new technologies improve task performance in a particular environment, in this case agricultural agriculture. Based on variable performance expectations connected to four indicators namely benefits, efficiency, and effectiveness, and the final indicator, Productivity, with expectations of consumer performance in the agricultural sector on Smart Farming technology. According to Zuiderwijk, Jansen, and Dwivedy, the realization of 2015 expectations is a changeable factor in one's acceptance and use of a new system or technology.

Thus, it can be concluded that the better the variable, as well as one's desire in acquiring and using the system or technology, the greater its effectiveness. According to Zuiderwijk, Jansen, and Dwivedy (2015), if a technology, especially in Smart Farming, makes a job or activity more efficient, then the use of that technology will be improved by the public. Based on this, administrators in the field of agriculture should increase the use of Smart Farming in agriculture in Malaysia by increasing the level of reporting of technological achievements by increasing the human resources (HR) working in the government in this matter. Smart Farming was seen as a good development by all involved. Smart Farming, according to many, is simply the process of using technology to assist farmers in making better choices.

2.3.2 EFFORT EXPECTANCY

The degree to which users feel the system will be easy or difficult to use is called effort expectation. It considers not only the financial aspects but also the

temporal aspects of a system, and it is often seen as preferable in the early phases of the adoption of a new system. Effort is expected in terms of money and time. Extra work is often associated with learning how to use and manage a system or technology rather than with the use itself, according to Zhang, D. in the journal Input Substitution, Productivity Performance and Farm Size in 2016. Another highly anticipated driving factor is uncertainty financial expenses, which may be due to technical changes, e.g.

According to the 2021 Census of Agriculture; Citeseer: Philadelphia, the perceived effort to adapt a new system or technology increases with one's work experience, given that the time required for the learning process is longer for those just starting out in the agricultural industry. Due to economies of scale, productivity gaps, market prices for inputs, and transaction costs for evaluating and purchasing new technologies, small farms tend to lag behind larger farms. As a result, the relationship between expected effort and behavioral intent was considered moderate according to farm size.

2.3.3 SOCIAL INFLUENCE

Social influence is determined by influential individuals, such as friends, co-workers, and family members, who persuade a person to utilise a system or technology. Relationships of age and seniority with career factors of engineers and scientists, according to Mansfield, R. In 1975's J. Applied Psychol, societal stress resulting from the media or politics is also discussed. Examining the social impact of coworkers, friends, and family on strategic farm choices reveals the significance of social influence to company growth, sustainable agriculture, and conservation practises, among others.

The social context, such as friends and family, impacts the growth of agricultural enterprises to some extent. agues with new technology had a considerable impact onIn addition, it was discovered that the experience of