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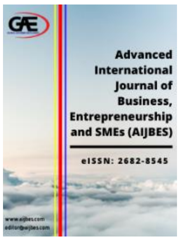

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FACTORS INFLUENCING SMALLHOLDERS MUSHROOM GROWERS' AWARENESS ON NEW MUSHROOM TECHNOLOGIES

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Abstract:

Mushroom cultivation has emerged as a key agricultural sector in Malaysia with significant income potential for smallholder growers, and under the National Agro-Food Policy 2021–2030 (NAP 2.0), mushrooms are designated as a high-value commodity aimed at boosting grower incomes. Despite agricultural-related agencies assisting mushroom growers in the form of agricultural inputs, mushroom growers keep facing challenges. Growers face significant challenges in improving the productivity and quality of fresh mushrooms due to threats of pests and diseases, unpredictable climate conditions, and the use of low-quality mushroom spawns. Increasing awareness of new technologies in mushroom farming is essential to overcome these challenges. Greater awareness plays a crucial role in leading mushroom growers to adopt new technologies. Despite their potential benefits, the adoption of new mushroom technologies remains relatively low. This is primarily due to insufficient exposure to their advantages and applications, along with growers' continued dependence on traditional farming methods. Financial constraints, rising raw material costs, and the challenges associated with maintaining fresh mushrooms with their high metabolic rate hinder adoption. Furthermore, many growers remain risk-averse, further slowing the transition to modern farming practices. The objective of this study is to

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determine the factors that influence smallholder mushroom growers' awareness on new mushroom technologies. A quantitative study using cluster random sampling involved face-to-face interviews with 140 smallholder mushroom growers across four regions in Peninsular Malaysia. The data were analysed using descriptive analysis, mean ranking analysis and multiple regression analysis. The findings indicated that performance expectancy and effort expectancy had a significant influence on growers' awareness of new mushroom technologies. Since performance expectancy and effort expectancy played a crucial role, training programs for mushroom growers were recommended, including hands-on training and digital tutorials to reduce perceived complexity. Therefore, effective policy interventions and enhanced extension services were essential to bridging the awareness gap.

Keywords:

Awareness, High-Value Commodity, Mushroom, Technologies, Smallholder Growers

Introduction

Mushrooms were categorized into four groups: edible mushrooms, which were fleshy and safe for consumption; medicinal mushrooms, recognized for their therapeutic properties; poisonous mushrooms, classified as toxic based on scientific evidence; and a miscellaneous group, which encompassed mushrooms with less clearly defined characteristics (Zahid et al., 2012; Nieminen & Mustonen, 2020). Edible mushrooms were distinguished by their high protein and carbohydrate levels, low fat content, and abundance of micronutrients, such as potassium, magnesium, phosphorus, selenium, and Vitamin D (Bhambri et al., 2022; Bakratsas et al., 2021; Niazi & Ghafoor, 2021; Kyanko et al., 2013). Sanchez (2017) stated that mushrooms had been consumed in large quantities due to their flavor and tender texture, along with their medicinal properties and ecological benefits.

Over the past 30 years, China had emerged as the world's largest producer of mushrooms and truffles, reaching over 48 million metric tons in 2024 (FAOSTAT, 2024). The top five countries for mushroom production from 2020 to 2024 had included China, United States of America, Netherlands, Poland and Italy as indicated in Table 1. China had continued to dominate global edible mushroom production, significantly outpacing other nations with its 2024 output (FAOSTAT, 2024).

Table 1: Top 5 Mushroom Producers Worldwide

No.	Country	Production (Million Tonnes)				
		2020	2021	2022	2023	2024
1.	China	40,008.1	41,134.8	45,360.5	47,149.4	48,000.0
2.	United States of America	370.3	378.8	318.6	302.4	300.0
3.	Netherlands	320.0	343.8	256.8	240.4	242.0
4.	Poland	260.0	260.0	235.0	205.0	206.0
5.	Italy	69.2	67.7	67.4	63.8	64.0

Source: FOASTAT (2024)

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In Malaysia, mushrooms have become an increasingly important part of the agricultural sector due to growing consumer awareness of their health benefits (Hanapiyah et al., 2024, Abdullah et al., 2023; Sakinah et al., 2020; Amin et al., 2017; Haimid et al., 2013). In 2023, the mushroom industry in Malaysia generated a total gross income of RM843,000 (DOA, 2024), even though mushroom industry remains a small contributor to the national economy but holds promising growth opportunities for both smallholder and commercial growers.

Table 2 below shows, over the five-year period from 2019 to 2023, the mushroom industry demonstrated a positive growth trend in both planted area and fresh mushroom production. The total planted area increased from 233 hectares in 2019 to 415 hectares in 2023, indicating a significant expansion in mushroom industry (DOA, 2024). Although there was a slight decline in 2020 (219 hectares) and 2022 (274 hectares), the overall trend shows a steady increase, with a sharp rise observed in 2023. Similarly, the production of fresh mushrooms grew from 8,798 metric tonnes in 2019 to 12,788 metric tonnes in 2023. Most of this production is driven by small and medium enterprises (SMEs), which play a pivotal role in Malaysia's mushroom industry, particularly in cultivating, packaging, and marketing fresh mushrooms. This upward trend in both area and production suggests increased interest and investment in mushroom farming, possibly driven by higher market demand, improved farming techniques, and greater awareness or adoption of new mushroom technologies among growers.

Table 2: Area Planted and Production of Fresh Mushroom, 2019 - 2023

No.	Year	2019	2020	2021	2022	2023
1.	Area planted (hectares)	233	219	286	274	415
2.	Production (metric tonnes)	8,798	7,620	10,802	10,997	12,788

Source: DOA (2024)

Oyster mushroom is the second most widely cultivated mushroom globally, is particularly prominent in Asia, America, and Europe (Zakil et al., 2022; Bellettini et al., 2019). Its popularity is driven by several key advantages, including cost-effectiveness during cultivation, high biological efficiency, adaptability to various climate conditions, minimal environmental control requirements, and a shorter growing cycle. Additionally, its fruiting bodies are less susceptible to pests and diseases compared to other edible mushrooms (Khairul et al., 2023, Ten et al., 2021; Bellettini et al., 2019). Malaysia's tropical climate, with its hot, humid conditions and high levels of annual rainfall, creates favourable conditions for oyster mushrooms (Patil et al., 2024; Ten et al., 2021; Abd Wahab et al., 2019; Amin et al., 2017). As outlined in Malaysia's National Agro-Food Policy 2021-2030 (NAP 2.0), mushrooms have been identified as one of high-value commodities with potential to boost grower incomes. This aligns with NAP 2.0's vision to develop a sustainable, resilient, and technology driven agro-food sector which aim to drive economic growth. Small and medium enterprises (SMEs) in the mushroom industry are integral to the development of the sector. These enterprises provide employment opportunities, contribute to rural development, and support local economies by engaging smallholder growers in mushroom cultivation.

Although government agencies have provided substantial support to smallholders through agricultural inputs such as infrastructure, equipment, advisory services, packaging, and training, mushroom growers continue to face numerous challenges. One of the most significant challenges in the mushroom industry is the low adoption of modern agricultural technologies among smallholders (Shariff et al., 2022; Subramaniam, 2021). Before the recent rise in

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technology adoption, most growers depended on traditional or conventional farming methods, rather than applying advanced technologies. In addition, smallholder mushroom growers are typically located in rural areas where limited digital connectivity and inadequate infrastructure hinder their access to information and the adoption of technological advancements (Omar et al., 2024; Rosnan & Yusof, 2023). Previous research highlights this low adoption rate as a key factor in reduced productivity and poor crop quality among growers (Khairul et al., 2023 Khairul et al., 2020; Ariffin et al., 2020; Rosmiza & Ghazali, 2020). Until recently, reliance on conventional methods limited both productivity and crop quality (Norton & Alwang, 2020; Rosmiza & Ghazali, 2020). Several studies have pointed out various barriers hindering technology adoption, such as limited financial resources, unpredictable climate changes, pest and disease threats (Ten et al., 2021; Rosmiza & Ghazali, 2020; Khairul et al., 2020), rising raw material costs (Saidan et al., 2023), and low-quality mushroom spawn (Khairul et al., 2023; Amin & Dani, 2020). Moreover, the high metabolic rates of fresh mushrooms and rapid quality degradation present significant challenges for growers (Sakinah et al., 2020). Growers' risk-averse attitudes and reluctance to adopt new technologies further worsen these issues (Ariffin et al., 2020). A lack of training and skills also contributes to the slow pace of technology adoption (Abdullah et al., 2023; Rosmiza & Ghazali, 2020). Without active information dissemination through extension services, media, or digital platforms, growers remain unaware of the technologies available to improve their production (Omar et al., 2024; Rosnan & Yusof, 2023).

The Twelfth Malaysia Plan 2021-2025 (12MP) underscores the role of modern technologies in enhancing productivity and income generation. To achieve sustainable mushroom production, technology adoption is essential. Technological advancement like the Controlled Environment Mushroom House (CEMH) have been developed by Malaysian Agricultural Research and Development Institute (MARDI) to mitigate the impacts of Malaysia's fluctuating weather by controlling temperature and humidity, thereby reducing contamination and increasing yield (Khairul et al., 2020; Ten et al., 2021; Islam et al., 2016). Furthermore, advancements in spawn production, such as liquid spawn technology, offer potential benefits over traditional grain spawn methods by accelerating inoculation and minimizing contamination (Khairul et al., 2023). Tools like the Adjusted Liquid Volume Injector (ALVI) have been designed to simplify the inoculation process, making it more efficient and reducing risks of contamination (Khairul et al., 2023; Khairul et al., 2020). Post-harvest handling remains another critical aspect of mushroom production. Due to their perishable nature, mushrooms typically last only 1 to 3 days at ambient temperature, or up to 7 days stored in chiller (Sakinah et al., 2020; Wan et al., 2019). Improved packaging technologies, such as Modified Atmosphere Packaging (MAP), can extend shelf life and maintain mushroom quality (Sakinah et al., 2020; Lyn et al., 2020). New technologies can play a central role in improving productivity and quality of fresh mushrooms, and they must receive good responses from growers towards their adoption. Thus, the objective of this study is to determine the factors that influence smallholder mushroom growers' awareness on new mushroom technologies.

Literature Review

Growers' Awareness

Awareness is the first step and a key aspect that is important for individuals or organisations before employing the innovation. Lindner et al. (1982) categorised awareness as the discovery phase. According to Randolph (2003) awareness describes as the knowledge or comprehension of a specific subject or situation. According to Kennedy (1962), awareness can be categorized

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into four types: safety, choice, information, and the right to be heard. In this study, growers' awareness falls under the category of "choice," which refers to their ability to make informed decisions regarding the selection of agricultural practices and technologies (Kumar et al., 2024). This type of awareness empowers growers to evaluate various options and choose the methods or technologies that best suit their farming needs, considering factors such as cost, efficiency, and potential benefits. By fostering greater awareness, growers can be better equipped to adopt innovations and make choices that positively impact their productivity and sustainability in the long term. Hunt (2002) suggested that awareness gradually shapes attitudes, typically leading to a positive outcome. However, new technologies often face limited awareness due to a lack of exposure compared to established practices (Balafoutis et al., 2020). Moreover, research indicates that assessing the level of awareness and identifying the sources through which growers receive information on these technologies are essential for evaluating their readiness to adopt new practices (Balafoutis et al., 2020; Nguyen et al., 2024). The review identifies the importance of targeted information dissemination through channels such as extension services, peer networks, and digital platforms (Nguyen et al., 2024). Furthermore, awareness about the innovation may occur either unwilling or voluntarily due to the problems encountered by the individual. This awareness then plays a mediating role in forming adoption intentions, as individuals who are well-informed about a technology are more likely to evaluate its feasibility and integrate it into their practices (Lee & Xia, 2006). According to Wan et al. (2012), awareness of consequence significantly influenced adoption intention. Specifically, in the agricultural sector, awareness of new farming technologies, including smart farming and biotechnology, has been shown to positively influence growers' intentions to adopt these innovations (Kumar et al., 2021).

Performance Expectancy

Performance expectancy is a key determinant in technology adoption models, including the Unified Theory of Acceptance and Use of Technology (UTAUT) introduced by Venkatesh et al. (2003). It refers to the extent to which individuals believe that adopting a particular technology will improve their performance (Venkatesh et al., 2003). Derived from the concept of perceived usefulness, performance expectancy relates to the belief that new technology can enhance work efficiency (Ronaghi & Forouharfar, 2020). Awareness plays a crucial role in the adoption process, as individuals must recognize both the existence and potential of a technology before considering its use (Rogers, 2003). Performance expectancy significantly influences this awareness by highlighting the expected benefits of the innovation. Awareness is often shaped by the perceived advantages technology can offer, such as increased yields, improved efficiency, reduced labor costs, and enhanced product quality (Dhanaraju et al., 2022; Gallardo & Sauer, 2018). Several studies indicate that performance expectancy strongly influences awareness of new technologies. Potential users are more likely to seek information when they perceive the technology as offering substantial benefits (Dhanaraju et al., 2022; Dwivedi et al., 2019; Gallardo & Sauer, 2018). When users perceive high performance expectancy, they are more motivated to explore the technology's functionalities and advantages, thereby increasing their awareness (Zhang et al., 2024). This suggests that enhancing performance expectancy through effective communication of a technology's benefits can be a strategic approach to fostering awareness, which, in turn, can strengthen adoption intentions (Abubakar & Ahmad, 2013; Gefen & Straub, 1997). As an example, growers are more likely to embrace innovations that offer enhanced production efficiency and cost savings, which aligns with the concept of performance expectancy. In agricultural technology adoption, growers who perceive new technologies as offering better productivity

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and cost-efficiency are more likely to adopt them, as they expect these technologies to meet their performance needs and deliver tangible benefits (Huang & Wang, 2024).

Effort Expectancy
Effort expectancy is a key determinant in the Unified Theory of Acceptance and Use of Technology (UTAUT), developed by Venkatesh et al. (2003). While according to Jambulingam (2013), effort expectancy is the degree to which a technology is easy to use. UTAUT draws the concept of the effort expectancy from the perceived ease of use from Technology Acceptance Model (TAM) and the complexity from Diffusion of Innovation (DOI) (Venkatesh & Davis, 2000). Effort expectancy refers to an individual's perception of how easy a technology is to use, influencing their willingness to explore (Venkatesh et al., 2003). In the context of awareness of new mushroom technologies, effort expectancy plays a key role in determining how accessible and understandable growers perceive these innovations to be. Technologies that are intuitive and easy to implement are more likely to gain attention and generate interest among growers (Cimperman et al., 2016; Sheng et al., 2016). This is in line with study by Dwivedi et al., (2019) found that individuals perceive a technology as easy to use, they are more likely to engage with it, leading to increased awareness. If a technology appears too difficult to integrate, growers may be less inclined to seek information about it (Zhang et al., 2024). On the other hand, when technologies are presented as user-friendly, potential users are more likely to recognize their potential benefits and explore them further. Access to technical support and training also influences effort expectancy. As an example, effective training programs, hands-on demonstrations, and accessible guidance can reduce perceived difficulty of new technologies (Zhang et al., 2024; Quaosar et al., 2018). In agriculture, growers who perceive smart farming tools as easy to operate tend to have higher awareness levels which lead to a greater adoption intention (Kumar et al., 2021).

Social Influence
Social influence refers to the extent to which individuals feel pressure from important others, such as peers, experts, or institutions, to adopt a particular technology (Venkatesh et al., 2003). The human is a social being that get influenced by the social aspects and social interaction surrounding him or her. Social influence is a condition where the user decides to use a particular technology which is influenced by friends and family and also important persons in the society. UTAUT draws the social influence from subjective norm from the Theory of Reasoned Action (TRA), Theory of Perceived Behaviour (TPB) and Technology Acceptance Model 2 (TAM 2), (Venkatesh & Davis, 2000). The influence of significant individuals in one's life plays a crucial role in shaping decisions (Ajzen, 1991). The effect of social influence is significant when the use of technology is required (Venkatesh et al., 2003). An individual might use technology due to compliance requirement, but not personal preferences (Venkatesh & Davis, 2000). Study by Dwivedi et al. (2019) suggests that social influence plays a crucial role in increasing awareness of new technologies, particularly in environments where word-of-mouth, social networks, and opinion leaders shape perceptions. Studies have shown that social interactions significantly impact the spread of awareness by facilitating knowledge exchange, reducing uncertainty, and enhancing trust in new technologies (Zhou et al., 2021). For instance, in the agricultural sector, growers often rely on recommendations from extension officers, fellow growers, and online communities to become aware of innovations such as precision farming (Kumar et al., 2021). When awareness levels are high, social pressure and community norms further encourage adoption, as growers observe successful implementation among their peers (Tian et al., 2021).

Facilitating Conditions

Facilitating conditions refer to the availability of necessary resources, infrastructure, and support systems that enable individuals to adopt and effectively use new technologies (Venkatesh et al., 2003). This includes the presence of resources, infrastructure, and support mechanisms that allow individuals to use new technology effectively. For instance, when adequate facilitating conditions are in place such as technical support, training programs, and financial incentives potential users are more likely to become aware of and adopt new technologies (Dwivedi et al., 2019). The concept of facilitating conditions encompasses individuals' perceptions of the organizational and technical support systems that exist within an organization to assist with innovative practices (Venkatesh et al., 2003). It aligns with concepts such as perceived behavioral control in the Theory of Planned Behavior (TPB) and compatibility in the Diffusion of Innovations (DOI) theory (Venkatesh & Davis, 2000). In the agricultural sector, for example, smallholder growers with access to extension services and training sessions are more likely to become aware of smart farming tools, which in turn increases their intention to adopt these technologies (Kumar et al., 2021). Extension services play a crucial role in helping growers adopt new technologies (Islam, 2018). In the current agricultural landscape, these services are key sources of information, providing growers with the necessary knowledge to adopt innovations. Through participation in training programs, demonstrations, and other extension activities, growers gain valuable insights that facilitate the adoption of new technologies. Therefore, agricultural extension services are critical in promoting the awareness and then lead to adoption of new agricultural technologies. Access to these services is an important facilitating condition that enables growers to embrace new technologies (Rahaman et al., 2020). However, information is often difficult to access by many smallholder growers who are mainly located in rural areas. Inadequate infrastructure such as roads, electricity, internet access, and reliable water source make it difficult for them to access training, extension services, or digital tools (Omar et al., 2024; Rosnan & Yusof, 2023). As a result, these growers often lack the opportunities to learn about new technologies, which lowers their awareness and reduces their ability to make informed decisions. This shows how limited facilitating conditions directly affect awareness levels and, in turn, hinder the adoption of innovation among rural mushroom growers.

Price Value

Price value refers to how individuals perceive the balance between the cost of a technology and its expected benefits, a key construct in the Unified Theory of Acceptance and Use of Technology 2 (UTAUT2), introduced by Venkatesh et al. (2012). Price value represents the user's perception of the trade-off between the financial cost of using a technology and its perceived benefits. When individuals perceive that the benefits of adopting a new technology outweigh its cost, they are more likely to develop awareness and actively seek information about it (Dwivedi et al., 2019). Price value accounts for the economic feasibility of technology adoption, making it particularly relevant in price-sensitive sectors. When growers recognize that new technologies offer better productivity at a competitive cost compared to traditional methods, their perception of price value improves, increasing their likelihood of adoption (Venkatesh et al., 2012). Awareness of the cost-benefit trade-off is essential, as growers need to understand how the long-term advantages, such as increased productivity and reduced operational costs, justify the initial investment (Rosmiza & Ghazali, 2020). Raising awareness about financial incentives, subsidies, and long-term economic gains can help growers make informed decisions about investing in new technologies (Rizzo et al., 2024). In agriculture, smallholder growers assess whether investing in smart farming technologies, such as precision

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farming and automated irrigation systems, provides sufficient returns on investment to justify the cost (Kumar et al., 2021; Rosmiza & Ghazali, 2020; Finger et al., 2019).

The literature highlights that growers' awareness is a critical first step in the adoption of technologies, as it enables informed decision-making. Awareness is categorized under "choice" by Kumar et al. (2024), emphasizing its role in empowering growers to evaluate technology options based on perceived benefits, efficiency, and cost. Performance expectancy, defined as the belief that technology will improve outcomes (Venkatesh et al., 2003), significantly influences awareness. According to Gallardo and Sauer (2016), when growers perceive substantial benefits such as increased yield and reduced costs, they are more likely to explore and consider adopting the technology. Effort expectancy, referring to how easy and accessible a technology is perceived to be, also shapes awareness. Cimperman et al. (2016) support this by stating that technologies that are intuitive and accompanied by adequate training tend to enhance user engagement. Additionally, social influence, including the roles of peers, institutions, and community norms, contributes to awareness by reducing uncertainty and building trust. Facilitating conditions, such as the availability of infrastructure, training, and ongoing support systems, are also essential in promoting awareness. Lastly, price value, or the growers' assessment of whether the innovation is worth the investment, further impacts their initial interest and consideration of new technologies.

Methodology

Conceptual Framework and Hypotheses

In this study, the integration of multiple frameworks such as Unified Theory of Acceptance and use of Technology 2 (UTAUT 2), and Diffusion of Innovation (DOI) to provides a comprehensive understanding of growers' awareness on adoption intention of new mushroom technologies. The UTAUT 2 framework integrates key factors such as performance expectancy, effort expectancy, social influence, facilitating conditions, and price value that play a crucial role in shaping growers' awareness (Cahyani et al., 2024; Jayashankar et al., 2018). The DOI model highlights awareness as critical in the early stages, aligning with the knowledge stage in DOI (Kee, 2017). At this stage, awareness facilitates growers' understanding of the potential benefits of new technologies, thereby influencing their adoption decisions (Chen & Li, 2022; Ruzzante et al., 2021). Hence, the integration of UTAUT 2 and DOI is essential to determine the grower awareness on adoption intention of new mushroom technologies. The conceptual framework (Figure 1) for this study was established as follows:

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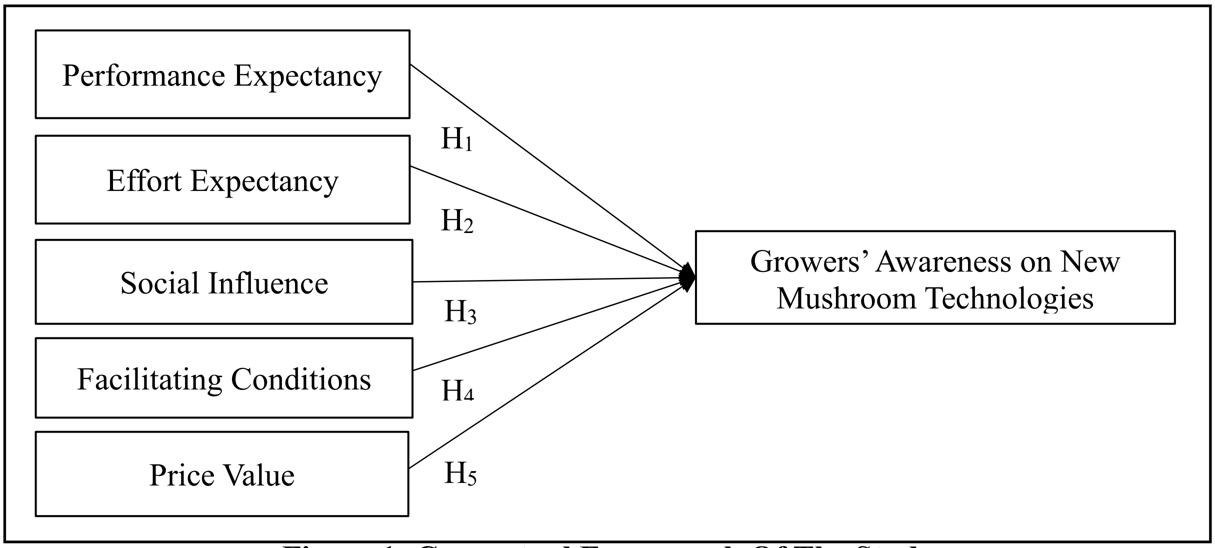

Figure 1: Conceptual Framework Of The Study
Source: Adapted and modified from Rogers (2003); Vankatesh et al. (2012)

Based on the conceptual framework above, the hypotheses tested for this study were as follows:

H_0:	Performance expectancy does not have a positive influence on growers' awareness of new mushroom technologies.
H_1:	Performance expectancy has a positive influence on growers' awareness of new mushroom technologies.
H_0:	Effort expectancy does not have a positive influence on growers' awareness of new mushroom technologies.
H_2:	Effort expectancy has a positive influence on growers' awareness of new mushroom technologies.
H_0:	Social influence does not have a positive influence on growers' awareness of new mushroom technologies.
H_3:	Social influence has a positive influence on growers' awareness of new mushroom technologies.
H_0:	Facilitating condition does not have a positive influence on growers' awareness of new mushroom technologies.
H_4:	Facilitating condition has a positive influence on growers' awareness of new mushroom technologies.
H_0:	Price value does not have a positive influence on growers' awareness of new mushroom technologies.
H_5:	Price value has a positive influence on growers' awareness of new mushroom technologies.

Sampling Method
A quantitative study was conducted to investigate the factors that influenced growers' awareness of new mushroom technologies. The total population of this study consisted of 218 smallholder mushroom growers that registered under Department of Agriculture (DOA). The directory of mushroom growers was obtained from Department of Agriculture (DOA) in 2023. In this study, the cluster random sampling method was used to collect data among 140 mushroom growers in Peninsular Malaysia from a population of 218 across Peninsular Malaysia. The Krejcie and Morgan table was used to determine the sample size of this study.

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A cluster sampling technique was employed in which the target population was initially stratified into distinct geographical clusters, specifically the northern, southern, central, and east coast regions. Each cluster represented a defined area with concentrations of mushroom growers. Within these clusters, respondents were randomly selected to reduce selection bias and to enhance the representativeness of the sample. Additionally, the number of respondents drawn from each cluster was proportionate to the estimated population of mushroom growers in that region, thereby ensuring that the sample distribution accurately reflected the regional composition of the overall population.

Research Instrument

This study employed a structured questionnaire to collect data through face-to-face interviews with 140 mushroom growers. The research instrument was developed according to the constructed framework, which comprised questions on socio-economic profiles, farm profiles, performance expectancy, effort expectancy, social influence, facilitating conditions, price value, and growers' awareness of new mushroom technologies. Open-ended questions were used to determine socio-economic and farm profiles, while closed-ended statements were established based on a 5-point Likert Scale. The scale ranged from 1 to 5, where 1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, and 5 = Strongly Agree.

Statistical Analysis

The questionnaire was designed to gather information on respondents' socio-economic profiles, farm profiles, and factors that influenced growers' awareness of new mushroom technologies. The collected data were analyzed using several statistical analyses, namely descriptive analysis, mean ranking analysis, and multiple regression analysis. Descriptive analysis was widely used by researchers (Misra et al., 2022; Oguntoye et al., 2022; Balafoutis et al., 2020) to analyze the frequency of data and characterize the socio-economic and farm profiles.

Mean ranking analysis was analysed to describe the responses using mean and standard deviation for each question. The mean is a measure of the central tendency that provides a general view of the data while standard deviation refers to a measure of dispersion that provides an estimate of data spread or variability (Sekaran & Bougie, 2013). Mean ranking analysis was conducted to describe the independent and dependent variables, namely performance expectancy, effort expectancy, social influence, facilitating condition, price value, and growers' awareness of new mushroom technologies. The results were then used as part of the variables and were run in multiple regression analysis. Five (5) statements in each variable with a 5-point Likert scale ranged from 1 to 5, where 1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, and 5 = Strongly Agree where analyzed.

The multiple regression analysis was conducted to further analyze the relationship between multiple independent variables and the dependent variable, based on the findings from the mean ranking analysis (Sharifzadeh et al., 2017). Five independent variables, namely performance expectancy, effort expectancy, social influence, facilitating condition, and price value, were selected as predictors of the dependent variable, which was awareness of new mushroom technologies. Thus, the multiple regression model for this study was as follows:

Growers' awareness on new mushroom technologies = $\beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \varepsilon$

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Where:
β_0 = constant
$\beta_1 - \beta_6$ = regression coefficient
X_1 = performance expectancy
X_2 = effort expectancy
X_3 = social influence
X_4 = facilitating condition
X_5 = price value
ε = error term

The Durbin-Watson statistics was calculated to assess multicollinearity in multiple regression analysis. Following Hair et al. (2010), the Durbin-Watson values were examined, and multicollinearity issues were evaluated based on the benchmark of 0.70 recommended by Tabachnick and Fidell (2001). The ideal Durbin-Watson statistics ranges between 1 and 3, with a value around 2 suggesting no autocorrelation indicates that there is no autocorrelation among the independent variables.

Results and Discussions

Socio-Economic Profiles of the Respondents

Results from this study revealed that the majority of respondents are male 71.0% (100), with females representing 29.0% (40). Age distribution shows that most of the respondents are between 31 to 40 years (59.3%, 83), followed by those aged 41 to 50 years (25.0%, 35). The ethnic composition is predominantly by Malay 78.0% (110), with Chinese 19.0% (26) and Indian only 3.0% (4). Marital status indicates that a significant portion, 83.0% (116), of the respondents are married, while 17.0% (24) are single. In terms of educational background, 30.0% (42) of the respondents hold a bachelor's degree, 26.4% (37) completed secondary school, 20.7% (29) possess a diploma, and 5.0% (7) of the respondents attended only primary school. Monthly income shows that 45.7% (64) of the respondents earn between RM3,001 to RM5,000 monthly, 42.1% (59) earn between RM1,000 to RM3,000, while 6.4% (9) report an income exceeding RM7,001, and only 2.9% (4) of the respondents earn below RM1,000 and between RM5,001 and RM7,000. Household size is primarily within the 4 to 6 member range (56.4%, 79), followed by 1 to 3 members (37.1%, 52) and over 7 members (6.4%, 9). Experience in mushroom farming varies, with 55.0% (77) of the respondents having 1 to 5 years' experience in mushroom farming, while 32.1% (45) with 6 to 10 years' experience, 7.9% (11) with 11 to 15 years' experience, and 1.2% (7) with over 16 years of experience. Position in the company patterns reveal that 94.3% (132) of the respondents are owners of their mushroom enterprises, while 5.7% (8) are directors. The socio-economic profiles of the respondents offer insights into the gender, age, race, marital status, educational levels, monthly income, household size, farming experience, and position in the company (Table 3).

Table 3: Socio-Economic Profiles of the Respondents

Profile	Frequency (n)	Percentage (%)
Gender		
• Male	100	71.0
• Female	40	29.0
Age		
• 21-30 years	7	4.9

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• 31-40 years	83	59.3
• 41-50 years	35	25.0
• 51-60 years	15	10.7
Race		
• Malay	110	78.0
• Chinese	26	19.0
• Indian	4	3.0
Marital Status		
• Single	24	17.0
• Married	116	83.0
Education Level		
• Primary school	7	5.0
• Secondary school	37	26.4
• Certificate	17	12.1
• Diploma	29	20.7
• Bachelor	42	30.0
• Master	8	5.7
Monthly Income		
• ≤ RM1,000	4	2.9
• RM1,001-RM3,000	59	42.1
• RM3,001-RM5,000	64	45.7
• RM5,001-RM7,000	4	2.9
• ≥ RM7,001	9	6.4
Household Size		
• 1-3 people	52	37.1
• 4-6 people	79	56.4
• ≥ 7 people	9	6.4
Experience in Mushroom Farming		
• 1-5 years	77	55.0
• 6-10 years	45	32.1
• 11-15 years	11	7.9
• ≥ 16 years	7	1.2
Position in The Company		
• Owner	132	94.3
• Director	8	5.7

Farm Profiles

The respondents of this study consisted of smallholder mushroom growers. Table 4 presents the farm profiles of the respondents in this study, providing insights into their farm size, number of mushroom houses, farm ownership and annual revenue. Majority of the respondents 60.0% (84) operate on a 0.5 acre, while 27.1% (38) of the respondents operate 1 acre mushroom farming. Besides, only a few have larger operation in 1.5 acres, 0.7% (1) and 12.1% (17) of the respondents operate in 2 acres farm size mushroom farming. Regarding the number of mushroom houses, 59.3% (83) of the respondents have between 6 to 10 mushroom houses, followed by 25.0% (35) of the respondents have 11 to 15 houses mushroom house, whereas only 4.9% (7) of the respondents operate on a smaller scale between 1 to 5 houses, and 10.7%

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(15) have more than 16 houses. Majority of the respondents 87.1% (122) have own their farm and only 12.9% (18) of the respondent were rented. Lastly, annual revenue varies among respondents, with the highest proportion 29.3% (41) earning between RM101,000 to RM150,000 per year, while 19.3% (27) of the respondents earning of RM51,000 to RM100,000. Meanwhile, 17.8% (25) of respondents have earning RM151,000 to RM200,000, followed by 12.1% (17) of respondents have earning between RM201,000 to RM 250,000 and 10.0% (14) of respondents earning between RM251,000 to RM300,000 per year. Only 3.5% (5) of the respondents earning more than RM350,000 per year.

Table 4: Farm Profiles of the Respondents

Profile	Frequency (n)	Percentage (%)
Farm Size		
• 0.5 acre	84	60.0
• 1 acre	38	27.1
• 1.5 acres	1	0.7
• 2 acres	17	12.1
Number of Mushroom House		
• 1-5 houses	7	4.9
• 6-10 houses	83	59.3
• 11-15 houses	35	25.0
• ≥ 16 houses	15	10.7
Farm Ownership		
• Own Farm	122	87.1
• Rental	18	12.9
Annual Revenue		
• ≤ RM50,000	11	7.8
• RM51,000-RM100,000	27	19.3
• RM101,000-RM150,000	41	29.3
• RM151,000-RM200,000	25	17.8
• RM201,000-RM250,000	17	12.1
• RM251,000-RM300,000	14	10.0
• ≥ RM301,000	5	3.5

Performance Expectancy, Effort Expectancy, Social Influence, Facilitating Condition, Price Value, and Growers' Awareness of New Mushroom Technologies

Table 5 summarize the mean score of thirty (30) statements related to performance expectancy, effort expectancy, social influence, facilitating condition, price value and growers' awareness on new mushroom technologies. The statements responded by the respondents based on 5-point Likert scales which were 1 = Strongly Disagree; 2 = Disagree; 3 = Neutral; 4 = Agree; 5 = Strongly Agree. The mean score were ranked according to the five ranges, as suggested by Ukundwanayo and Rulinda, (2024) where 1.00 to 1.80 indicated very low, from 1.81 to 2.60 indicates low, from 2.61 to 3.40 indicates moderate, from 3.41 to 4.20 indicates high and from 4.21 to 5.00 is very high. Each variable consisted of five statements, with growers' awareness of new mushroom technologies (4.79) having the highest average mean, followed by performance expectancy (4.65), effort expectancy (4.61), social influence (4.54), and facilitating conditions (4.52) , while price value (4.44) had the lowest average mean. Based on

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Table 5, all items were ranked in the 'very high' range between 4.21 to 5.00, showing that all respondents responded in the same direction.

Based on Table 5, the highest mean score was for the statement of "*I believe new mushroom technologies will improve my farm productivity*" with the mean score of 4.69. This is in line with the study of Zhang et al. (2024) where new technology would improve the farm productivity. This is followed by *"I expect that new mushroom technologies will increase my crop yield"* with the mean score of 4.66, showing that growers expect an increase in productivity when , which is crucial for agricultural success. While *"I think new mushroom technologies will help me manage my farm more effectively"* and *"I expect that new mushroom technologies will increase my profits over time"* had similar mean score of 4.65, suggesting that growers recognize the role of these technologies in enhancing farm management efficiency and generating higher profits over time. Lastly, statement of *"I believe new mushroom technologies will enhance the quality of my mushrooms"* is the lowest mean score of 4.61 in performance expectancy suggests that growers see quality enhancement when using new technologies. With an average mean of 4.65, the data indicates that growers perceive new mushroom technologies as highly beneficial, particularly in improving productivity and profit. This is consistent with the findings of Sazali et al. (2024), who reported that higher productivity is a major factor driving the adoption of new technologies, as growers prefer innovations that enhance production efficiency and reduce costs.

In effort expectancy, statement of *"I believe new mushroom technologies can be integrated into my farm without much difficulty"* with highest mean score of 4.71, indicating that growers strongly believe new mushroom technologies can be integrated into their farms without much difficulty. This is followed by statement of *"Learning to operate new technologies during mushroom cultivation would be easy for me"* with the mean score of 4.66, suggesting that learning to operate these technologies is perceived as relatively easy, while statement of *"I believe I would need minimal training to use new mushroom technologies effectively"* with the mean score of 4.64 ranks next, showing that growers feel minimal training is required for effective use. Then, statement of *"I feel comfortable with new mushroom technologies"* with the mean score of 4.61 suggests that growers are generally comfortable with the technologies needed for mushroom farming. Lastly, statement of "It *would be easy for me to become skillful of new technologies in mushroom cultivation"* with the mean score of 4.46 has the lowest mean, indicating that while growers find it easy to become skillful with new technologies. With an average mean of 4.61, the findings suggest that growers have a positive perception of the ease of learning and integrating new mushroom technologies, with the least concern about their usability and adaptability.

In social influence, the highest mean score was for the statement of *"I am influenced by other mushroom growers who are knowledgeable about new technologies"* with the mean score of 4.58, indicating that growers are most influenced by other mushroom growers who have knowledge about new technologies. This is closely followed by statement of *"People I respect believe there are benefits of new mushroom technologies"* with the mean score of 4.57, showing that the opinions of respected individuals believe that new mushroom technologies offer valuable benefits. The statement of *"Many support is available for me from the mushroom growers community on new technologies"* with the mean score of 4.56 ranks next, highlighting strong support from the mushroom growers' community in learning about new technologies, followed by statement of "*Other successful growers I know use new mushroom technologies" w*ith the mean score of 4.51 suggests that the adoption of new mushroom technologies by other

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successful growers also serves as motivation. Lastly, statement of *"People important to me encourage to understand more on new mushroom technologies"* with the mean score of 4.46 has the lowest mean, implying that while encouragement from important individuals is encourage to learn more about new mushroom technologies. With an average mean of 4.54, the results indicate that growers are highly influenced by their peers, respected individuals, and the availability of community support when considering new mushroom technologies.

Results for facilitating condition in Table 5 shows that statement of *"I have the resources needed for new mushroom technologies"* has the highest mean score of 4.56, indicating that growers have access to the necessary resources on new mushroom technologies. This is followed by statement of *"Assistance (extension services) of new mushroom technologies is available for me"* with the mean score of 4.54, which suggests that growers recognize the availability of assistance in new mushroom technologies. The extension services related to the mushroom industry are important because they help growers increase productivity, reduce the risk of losses, and adopt sustainable farming practices by providing relevant information and training (Salam et al., 2024).

Both statement of *"I would be able to get help from the mushroom growers community if I have difficulties of new technologies"* and "*I believe that the infrastructure needed for new mushroom technologies is available to me"* share the same mean score of 4.53, highlighting that growers perceive strong community support and sufficient infrastructure as crucial factors in new technologies. Lastly, statement of *"I have access to the necessary technical support for new mushroom technologies"* has the lowest mean score of 4.46 implying that while technical support is accessible, it is slightly less emphasized compared to other facilitating conditions. With an average mean of 4.52, the results suggest that resource availability, assistance, and community support play vital roles in enabling the adoption of new mushroom technologies.

For price value, statement of *"I believe that new mushroom technologies offer good value for the price"* has the highest mean score of 4.51, indicating that growers strongly believe new mushroom technologies offer good value for their price. This is followed by statement of *"I am willing to pay a reasonable price for new mushroom technologies that can improve my mushroom yield and quality"* with the mean score of 4.49, showing that growers are generally willing to pay a reasonable price for technologies that improve their yield and quality. The statement of *"The potential benefits of new mushroom technologies justify their cost"* with the mean score of 4.42 suggesting that the perceived benefits of these technologies justify their cost while statement of *"I expect that investing in new mushroom technologies will provide a good return on my investment"* with the mean score of 4.41 follows closely, reflecting the expectation of a good return on investment. Lastly, statement of *"The price of new mushroom technologies is generally affordable for my farm"* with the mean acore of 4.39 has the lowest mean, implying that while growers recognize the value of new technologies, affordability remains a slightly lower consideration. With an average mean of 4.44, the findings suggest that while cost is a factor, growers place greater emphasis on value, benefits, and return on investment when considering new mushroom technologies.

The result of growers' awareness on new mushroom technologies finding that the highest mean score is based on statement of *"I am aware of the different types of new mushroom technologies"*, "*I understand the benefits of new mushroom technologies for my farm"* and *"I actively seek information on mushroom farming technology advancements"* have same mean score of 4.81, indicating that growers have a high level of awareness regarding different types

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of mushroom technologies, understand their benefits, and actively seek information on advancements in mushroom farming technology. This is followed by the statement of "*I am informed about the potential outcomes of new mushroom technologies*" with the mean score of 4.79 , suggesting that growers are well-informed about the potential outcomes of new mushroom technologies. Lastly, statement of *"I know where to get information about the latest mushroom technologies"* with the mean score of 4.71 has the lowest mean, there is slightly less certainty about where to obtain the latest information on mushroom technologies. With an average mean of 4.79, the findings suggest that awareness among growers is generally high, with strong engagement in learning about and understanding new mushroom technologies.

Table 5: Mean Ranking Analysis of Performance Expectancy, Effort Expectancy, Social Influence, Facilitating Condition, Price Value, and Growers' Awareness on New Mushroom Technologies

Items	Mean	Standard Deviation
Performance Expectancy		
I believe new mushroom technologies will improve my farm productivity.	4.69	0.463
I expect that new mushroom technologies will increase my crop yield.	4.66	0.476
I think new mushroom technologies will help me manage my farm more effectively.	4.65	0.479
I expect that new mushroom technologies will increase my profits over time.	4.65	0.479
I believe new mushroom technologies will enhance the quality of my mushrooms.	4.61	0.489
Average mean and standard deviation	**4.65**	**0.441**
Effort Expectancy		
I believe new mushroom technologies can be integrated into my farm without much difficulty.	4.71	0.457
Learning to operate new technologies during mushroom cultivation would be easy for me.	4.66	0.476
I believe I would need minimal training to use new mushroom technologies effectively.	4.64	0.483
I feel comfortable with new mushroom technologies.	4.61	0.490
It would be easy for me to become skilful of new technologies in mushroom cultivation.	4.46	0.501
Average mean and standard deviation	**4.61**	**0.397**
Social Influence		
I am influenced by other mushroom growers who are knowledgeable about new technologies	4.58	0.496
People I respect believe there are benefits of new mushroom technologies.	4.57	0.497
Many supports is available for me from the mushroom growers community on new technologies.	4.56	0.499
Other successful growers I know use new mushroom technologies.	4.51	0.502

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People important to me encourage to understand more on new mushroom technologies.	4.46	0.501
Average mean and standard deviation	**4.54**	**0.441**
Facilitating Condition		
I have the resources needed for new mushroom technologies.	4.56	0.499
Assistance (extension services) of new mushroom technologies is available for me.	4.54	0.501
I would be able to get help from the mushroom growers' community if I have difficulties of new technologies.	4.53	0.501
I believe that the infrastructure needed for new mushroom technologies is available to me.	4.53	0.501
I have access to the necessary technical support for new mushroom technologies.	4.46	0.501
Average mean and standard deviation	**4.52**	**0.413**
Price Value		
I believe that new mushroom technologies offer good value for the price.	4.51	0.569
I am willing to pay a reasonable price for new mushroom technologies that can improve my mushroom yield and quality.	4.49	0.606
The potential benefits of new mushroom technologies justify their cost.	4.42	0.635
I expect that investing in new mushroom technologies will provide a good return on my investment.	4.41	0.634
The price of new mushroom technologies is generally affordable for my farm.	4.39	0.607
Average mean and standard deviation	**4.44**	**0.479**
Growers' Awareness on New Mushroom Technologies		
I understand the benefits of new mushroom technologies for my farm.	4.81	0.390
I am aware of the different types of new mushroom technologies.	4.81	0.396
I actively seek information on mushroom farming technologies advancements.	4.81	0.396
I am informed about the potential outcomes of new mushroom technologies.	4.79	0.407
I know where to get information about the latest mushroom technologies.	4.71	0.453
Average mean and standard deviation	**4.79**	**0.310**

Factors that Influence Growers' Awareness on New Mushroom Technologies

Multiple regression analysis was conducted to identify the most influential factors affecting growers' awareness on new mushroom technologies. Table 6 summarizes the results, revealing a strong predictive ability of the model. The correlation coefficient (R) value is 0.819, indicating a high correlation between the independent variables and the dependent variable. The coefficient of determination (R^2) provides insights into the goodness of fit of the regression model (Sharifzadeh et al., 2017). Specifically, R^2 reflects the proportion of variance in the

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dependent variable explained by the independent variables. According to Sellam and Poovammal (2016) an R^2 value above 0.5 for the model to be considered higher explanatory power. In this study, the R^2 value of 0.671 suggests that 67.1% of the variance in growers' awareness of new mushroom technologies is explained by performance expectancy, effort expectancy, social influence, facilitating conditions, and price value, while the remaining 32.9% is attributable to other factors not considered in this model. The adjusted R^2 value of 0.659 further supports the model's robustness, indicating that the significant predictor variables collectively account for 65.9% of the variance in growers' awareness. This leaves 34.1% of the variation unexplained, suggesting the presence of additional influencing factors that permit further investigation. Furthermore, the Durbin-Watson value in Table 5 is 2.552, indicating that there is no significant autocorrelation in the residuals of the regression model.

Table 6: Model Summary of Growers' Awareness on New Mushroom Technologies

Model	R	R square (R^2)	Adjusted R^2	Standard Error	R Square Change	F Change	df1	df2	*p*	Durbin-Watson
1	0.819	0.671	0.659	0.279	0.671	54.717	5	134	0.001*	2.552

Note:
*Significant at 1% level of significance

Given the high R^2 value, it can be suggested that the regression model effectively explains the total variation in growers' awareness of new mushroom technologies. The F-test value of 54.717 is significant at $p < 0.001$, confirming that the model significantly predicts growers' awareness based on the selected independent variables. This implies that the combination of performance expectancy, effort expectancy, social influence, facilitating condition, and price value as a predictor has a significant contribution to growers' awareness on new mushroom technologies. These findings align with previous studies (Zhang et al., 2024), which suggest that awareness of new agricultural technologies is strongly influenced by growers' expectations regarding perceived usefulness and ease of use of technologies.

Table 7 presents the unstandardized regression coefficient (b) and standardized regression coefficient (β) used to assess the contribution of each independent variable to growers' awareness of new mushroom technologies. The standardized regression coefficient (β) allows for direct comparison of the strength of each predictor variable. Based on Table 7, performance expectancy exhibited the highest standardized coefficient ($\beta = 0.645$), indicating that it is the strongest predictor of growers' awareness. This means that, a one unit increase in performance expectancy leads to a 0.645 unit increase in growers' awareness of new mushroom technologies, making it the most significant predictor ($p = 0.001$). The finding suggests that when growers perceive new mushroom technologies as beneficial in terms of yield improvement, cost efficiency, and quality enhancement, their awareness of such technologies increases significantly (Acharya, & Sarangi, 2024; Rukhiran et al., 2023; Molina-Maturano et al., 2021; Zhang et al., 2014). According to Mohr and Kühl (2021); Rahi et al. (2019), performance expectancy is a key determinant in technology adoption, as perceived usefulness directly impacts awareness.

The second highest standardized coefficient was effort expectancy ($\beta = 0.225$), which reflects the perceived ease of use of the technology. Similarly, a one unit increase in effort expectancy results in a 0.225 unit increase in awareness, which is also statistically significant ($p = 0.012$). Technologies that are easier to integrate into existing farming practices tend to generate greater

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awareness among growers (Limpamont et al., 2024; Dessart et al., 2019; Mariano et al., 2012). However, social influence (β = 0.013, p = 0.878), facilitating conditions (β = 0.013, p = 0.905), and price value (β = 0.044, p = 0.514) insignificant, indicating that these factors do not substantially impact growers' awareness in this study. Facilitating conditions and social influence, as highlighted in previous studies (Vanduhe et al., 2020; Tiraieyari et al., 2019), were insignificant due to lack of adequate infrastructure, where facilitating conditions did not play a crucial role in influencing awareness. Similarly, social influence was not significant, growers rely more on personal experiences rather than external opinions when adopting new technologies. This aligns with previous research by Junior et al. (2022) indicating that financial concerns may pose barriers to awareness and subsequent on adoption of new agricultural technologies.

Table 7: Coefficient of Multiple Linear Regression for Growers' Awareness on New Mushroom Technologies

(Y) Growers' Awareness on New Mushroom Technologies					
Model	Unstandardized Coefficients		Standardized Coefficient	*t*	*p*
	b	Std. Error	Beta (ß)		
Constant	0.161	0.383		0.421	0.674
Performance Expectancy	0.747	0.100	0.645	7.505	0.001*
Effort Expectancy	0.271	0.106	0.225	2.544	0.012**
Social Influence	0.015	0.095	0.013	0.154	0.878
Facilitating Condition	0.014	0.113	0.013	0.120	0.905
Price Value	0.069	0.105	0.044	0.655	0.514

Note:
*Significant at 1% level of significance
**Significant at 5% level of significance

The value of the unstandardized coefficient for performance expectancy, effort expectancy, social influence, facilitating condition and price value were 0.747, 0.271, 0.015, 0.014 and 0.069 as shown in Table 7. The unstandardized coefficient (b) value of the respected variables indicated the change amount in the dependent variables (Y) by the change of one unit of an independent variable (X). Based on the estimated unstandardized coefficients, the regression equation for predicting growers' awareness of new mushroom technologies is:

$$Y = 0.161 + 0.747\ (\text{Performance Expectancy}) + 0.271\ (\text{Effort Expectancy}) + 0.015\ (\text{Social Influence}) + 0.014\ (\text{Facilitating Condition}) + 0.069\ (\text{Price Value}) + \varepsilon$$

Summary of the Findings

Table 8 presents a summary of the key findings from the study, organized into four main sections: socio-economic profiles, farm profiles, mean ranking analysis, and multiple regression analysis. The socio-economic and farm profiles provide an overview of the demographic and operational characteristics of smallholder mushroom growers. The mean ranking analysis identifies the relative importance of factors such as performance expectancy, effort expectancy, social influence, facilitating conditions, and price value in influencing growers' awareness of new mushroom technologies. The multiple regression analysis further reveals the strength and significance of each factor in predicting this awareness.

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Table 8: Summary of the Key Findings

Section	Variable / Factor	Key Findings
1. Socio-Economic Profiles	Gender	Most respondents (71.0%) were male, indicating that mushroom cultivation is male-dominated.
	Age	The majority of respondents (59.3%) were aged between 31 and 50 years, representing an active and productive age group among smallholder mushroom growers.
	Race	Most respondents (78.0%) were Malay.
	Marital Status	The majority of respondents (83.0%) were married.
	Education Level	Respondents generally held bachelor's degree qualifications (30.0%), reflecting a moderate educational background.
	Monthly Income	Monthly incomes typically ranged from RM3,001 to RM5,000 (45.7%), which is consistent with the expected earnings of smallholder growers.
	Household Size	The majority of growers' households (56.4%) consist of 4 to 6 people.
	Farming Experience	The majority of growers (55.0%) had 1 to 5 years of farming experience, suggesting they are relatively new but have gained a moderate level of practical knowledge in mushroom cultivation.
	Position in the Company	Most of the respondents (94.3%) were the owner of the company.
2. Farm Profiles	Farm Size	The majority of farms (60.0%) were 0.5 acre in size, confirming the small-scale nature of mushroom farming operations.
	Number of Mushroom House	Most of the respondents (59.3%) have between 6 to 10 mushroom houses.
	Farm Ownership	The majority of respondents (87.1%) have their own farms.
	Annual Revenue	Most growers (29.3%) have annual revenue between RM101,000 to RM150,000.
3. Mean Ranking Analysis	Performance Expectancy	Performance expectancy received the highest mean score of 4.65, showing that growers highly value improvements in yield and product quality.
	Effort Expectancy	Effort expectancy ranked second with the mean score of 4.61, emphasizing the importance of simplicity and ease of use in new technologies.
	Social Influence	Social influence scored moderately with the mean score of 4.54, indicating that peer or community pressure has a limited impact on awareness.
	Facilitating Conditions	Facilitating conditions also scored moderately with the mean score of 4.52, revealing that infrastructure and support services are not widely available.

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		Price Value	Price value received the lowest score with the mean score of 4.44, suggesting that cost is not a major concern in influencing awareness.
		Growers' Awareness on New Mushroom Technologies	With an average mean of 4.79, growers demonstrate a high level of awareness and strong engagement in learning about and understanding new mushroom technologies.
4.	Multiple Regression Analysis	Performance Expectancy	Performance expectancy had a significant positive effect on awareness ($p < 0.001$), making it the strongest predictor among the studied factors.
		Effort Expectancy	Effort expectancy also showed a significant positive effect ($p < 0.05$), indicating its key role in shaping growers' awareness.
		Social Influence	Social influence was found to be not significant, implying that awareness is not strongly determined by social pressures.
		Facilitating Conditions	Facilitating conditions did not show a significant effect, suggesting that support systems are not yet critical in raising awareness.
		Price Value	Price value was not a significant predictor, indicating that financial considerations do not substantially affect awareness levels.

Conclusion

This study has successfully achieved its objective of determining the factors that influence smallholder mushroom growers' awareness of new mushroom technologies. Findings from this study indicate that performance expectancy and effort expectancy positively influence growers' awareness of new mushroom technologies. It is confirming their critical role in shaping growers' awareness and readiness to engage with emerging innovations. While social influence and facilitating conditions show some effect, they are not statistically significant drivers of awareness. Additionally, the non-significant effect of price value suggests that cost concerns are not a major factor in shaping awareness at this stage.

To improve awareness, several recommendations are proposed. Given the strong role of performance expectancy, training programs offered by agencies within the mushroom industry should emphasize the tangible benefits of new technologies, such as increased yield and improved product quality. The influence of effort expectancy highlights the importance of simplifying technologies and providing hands-on training, including digital tutorials, to reduce perceived complexity and encourage adoption.

This study is not without its limitations. Time and resource constraints limited both the duration and geographical scope of data collection, which focused only on selected regions and may not represent the broader population of mushroom growers. Financial constraints further impacted the scale of data collection. Additionally, the relatively small sample size from each state limits the generalizability and statistical strength of the findings. Gathering responses was also challenging due to growers' privacy concerns and scepticism about the benefits of participation. These limitations may restrict the study's ability to fully capture the diversity of growers' experiences and perspectives.

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In conclusion, this study identifies key strategies for enhancing growers' awareness of new mushroom technologies. Strengthening extension services and implementing targeted policy measures are essential to bridging the awareness gap. Future research should examine the behavioural and economic factors that influence awareness, given its pivotal role in shaping technology adoption intentions. Advanced technologies hold considerable potential to improve product quality, boost productivity, and extend shelf life, which are key priorities for smallholder mushroom producers.

Building on these findings, the study contributes to the broader discourse on agricultural technology adoption by emphasizing its impact on the productivity and sustainability of the mushroom industry. It focuses on the behavioural perspective of growers and positions awareness as a critical precursor during the early stages of adoption. Theoretically, the study addresses an important research gap and proposes a more comprehensive framework to guide future studies on early adoption behaviour. These findings offer useful guidance for policymakers and agricultural agencies. They can use the results to develop effective awareness strategies for early adopters through targeted training, tailored support programs, and strategic communication. This can help speed up the adoption of new mushroom technologies. The study also adds to the understanding of early-stage adoption and suggests practical steps to increase technology acceptance among smallholder mushroom growers.

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References

Abd Wahab, H., Manap, M. Z. I. A., Pauline, O., Ismon, M., Zainulabidin, M. H., Noor, F. M., & Mohamad, Z. (2019). Investigation of temperature and humidity control system for mushroom house. *International Journal of Integrated Engineering, 11*(6), 27-37.

Acharya, S., & Sarangi, D. N. (2024). Enhancing Livelihood Security via Mushroom Production: A Case Study of Technological Support and Farmers' Ingenuity. *International Journal of Social Science*, *13*(2), 81-89.

Ariffin, M. A. M., Ramli, M. I., Amin, M. N. M., Ismail, M., Zainol, Z., Ahmad, N. D., & Jamil, N. (2020, November). Automatic climate control for mushroom cultivation using IoT approach. *The 2020 IEEE 10th International Conference on System Engineering and Technology (ICSET) 9th November 2020*, Shah Alam, Malaysia, 123-128.

Bakratsas, G., Polydera, A., Katapodis, P., & Stamatis, H. (2021). Recent trends in submerged cultivation of mushrooms and their application as a source of nutraceuticals and food additives. *Future Foods, 4*, 1-14.

Balafoutis, A. T., Evert, F. K. V., & Fountas, S. (2020). Smart farming technology trends: Economic and environmental effects, labor impact, and adoption readiness. *Agronomy, 10*(5), 743-769.

Bellettini, M. B., Fiorda, F. A., Maieves, H. A., Teixeira, G. L., Ávila, S., Hornung, P. S., Junior, A. M., & Ribani, R. H. (2019). Factors affecting mushroom *Pleurotus spp. Saudi Journal of Biological Sciences, 26*(4), 633-646.

Bhambri, A., Srivastava, M., Mahale, V. G., Mahale, S., & Karn, S. K. (2022). Mushrooms as potential sources of active metabolites and medicines. *Frontiers in Microbiology, 13*, 1-21.

Advanced International Journal of Business, Entrepreneurship and SME's
AIJBES
EISSN: 2682-8545
Volume 7 Issue 24 (June 2025) PP. 362-386
DOI 10.35631/AIJBES.724024
Cahyani, A. D., Basuki, A., Negara, Y. D. P., Rochman, E. M. S., Yusuf, M., & Setiawan, W. (2024). Farmers' adoption of smart agriculture technology: A UTAUT approach. *SSRN*. 5070209.

Chen, X., & Li, T. (2022). Diffusion of agricultural technology innovation: Research progress of innovation diffusion in Chinese agricultural science and technology parks. *Sustainability, 14*(22), 1-23.

Department of Agriculture Malaysia (DOA). (2024). *Booklet statistik tanaman 2024*. Retrieved from https://www.doa.gov.my/doa/resources/aktiviti_sumber/sumber_awam/penerbitan/statistik_tanaman/booklet_statistik_tanaman_2024.pdf

Dhanaraju, M., Chenniappan, P., Ramalingam, K., Pazhanivelan, S., & Kaliaperumal, R. (2022). Smart farming: Internet of Things (IoT)-based sustainable agriculture. *Agriculture, 12*(10), 1-26.

Food and Agriculture Organization of the United Nations (FAO). (2024). *FAOSTAT: Crops and livestock products*. Retrieved from https://www.fao.org/faostat/en/#data/QCL

Hanapiyah, Z. M., Ahmad Fadzil, A. S., Shaari, N. F., Sulaiman, H., Adam, S., & Mohd Khodri, A. N. (2024). Exploring entrepreneur intention in the mushroom industry with government support in Malaysia. *Information Management and Business Review, 16* (4) 330-339.

Huang, W., & Wang, X. (2024). The impact of technological innovations on agricultural productivity and environmental sustainability in China. *Sustainability*, *16*(19), 1-37.

Islam, M. D. T., Zakaria, Z., Hamidin, N., & Mohdishak, M. A. B. (2016). Effects of natural environment and increased ranges of humidity for indoor cultivation of grey oyster (*Pleurotus pulmonarius*) mushroom in Malaysia. *International Journal of Advances in Science Engineering and Technology, 4*(2), 121-127.

Junior, M. B., Pinheiro, E., Sokulski, C. C., Huarachi, D. A. R., & De Francisco, A. C. (2022). How to identify barriers to the adoption of sustainable agriculture? A study based on a multi-criteria model. *Sustainability*, *14*(20), 1-18.

Khairul, A. K., Ganisan, K., Ten, S. T., & Ahmad Fuad, B. (2020). Teknologi MARDI berasaskan cendawan: Impak terhadap pengusaha cendawan tempatan. *Agromedia, 58*, 80-82.

Kumar, V., Sharma, K. V., Kedam, N., Patel, A., Kate, T. R., & Rathnayake, U. (2024). A comprehensive review on smart and sustainable agriculture using IoT technologies. *Smart Agricultural Technology 8,* 1-22.

Limpamont, A., Kittipanya-ngam, P., Chindasombatcharoen, N., & Cavite, H. J. M. (2024). Towards agri-food industry sustainability: Addressing agricultural technology adoption challenges through innovation. *Business Strategy and the Environment*, *33*(7), 7352-7367.

Misra, R., Mahajan, R., Singh, N., Khorana, S., & Rana, N. P. (2022). Factors impacting behavioural intentions to adopt the electronic marketplace: findings from small businesses in India. *Electronic Markets, 32*(3), 1639–1660.

Mohr, S., & Kühl, R. (2021). Acceptance of artificial intelligence in German agriculture: an application of the technology acceptance model and the theory of planned behavior. *Precision Agriculture*, *22*(6), 1816-1844.

Molina-Maturano, J., Verhulst, N., Tur-Cardona, J., Güereña, D. T., Gardeazábal-Monsalve, A., Govaerts, B., & Speelman, S. (2021). Understanding smallholder farmers' intention to adopt agricultural apps: The role of mastery approach and innovation hubs in Mexico. *Agronomy, 11*(2), 194-217.

Advanced International Journal of Business, Entrepreneurship and SME's
AIJBES
EISSN: 2682-8545
Volume 7 Issue 24 (June 2025) PP. 362-386
DOI 10.35631/AIJBES.724024
Niazi, A. R., & Ghafoor, A. (2021). Different ways to exploit mushroom: A review. *All Life, 14*(1), 450-460.

Nieminen, P. & Mustonen, A. M. (2020). Toxic potential of traditionally consumed mushroom species: A controversial continuum with many unanswered questions. *Toxins, 12*(10), 639-649.

Nguyen, L. L. H., Khuu, D. T., Halibas, A., & Nguyen, T. Q. (2024). Factors that influence the intention of smallholder rice farmers to adopt cleaner production practices: An empirical study of precision agriculture adoption. *Evaluation Review, 48*(4), 692-735.

Omar, Z., Saili, A. R., Fatah, A. F., Aziz, A. A., Yusup, Z., & Rola-Rubzen, F. (2024). Exploring the challenges of adopting smart farming in the agriculture sector among smallholders in Malaysia. *International Journal Academic Research Business and Social Science*, *14*, 1702-14.

Patil, R., Ramli, A. N. M., Xuan, A. S., Xin, N. Z., Azelee, N. I. W., & Bhuyar, P. (2024). Unlocking the growth potential: Harnessing the power of synbiotics to enhance cultivation of *Pleurotus spp. Journal of Zhejiang University-SCIENCE B, 25*(4), 293-306.

Rahaman, M. S., Sarkar, M. A. R., Rahman, M. C., Kabir, M. J., Islam, M. A., & Siddique, M. A. B. (2020). Drivers of adoption of BRRI cultivars in Boro season among farm households of Mymensingh district, Bangladesh. *Journal of the Bangladesh Agricultural University*, *18*(3), 660-666.

Rizzo, G., Migliore, G., Schifani, G., & Vecchio, R. (2024). Key factors influencing farmers' adoption of sustainable innovations: a systematic literature review and research agenda. *Organic Agriculture*, *14*(1), 57-84.

Ronaghi, M. H., & Forouharfar, A. (2020). A contextualized study of the usage of the Internet of things (IoTs) in smart farming in a typical Middle Eastern country within the context of Unified Theory of Acceptance and Use of Technology model (UTAUT). *Technology in Society*, *63*, 1-10.

Rosmiza, M. Z., & Ghazali, M. H. (2020). Challenges in the mushroom project as a basis of career transition of agro-entrepreneurship for Special Needs Pupils with Learning Difficulties. *Geografia*, *16*(1), 46-61.

Rosnan, H., & Yusof, N. (2023). Digital technologies and small-scale rural farmers in Malaysia. In B. Alareeni, A. Hamdan, R. Khamis, & R. E. Khoury (Eds.), *Digitalisation: Opportunities and challenges for business* (Lecture Notes in Networks and Systems, Vol. 620, pp. 776-783. Springer.

Rukhiran, M., Sutanthavibul, C., Boonsong, S., & Netinant, P. (2023). IoT-based mushroom cultivation system with solar renewable energy integration: Assessing the sustainable impact of the yield and quality. *Sustainability, 15*(18), 1-33.

Ruzzante, S., Labarta, R., & Bilton, A. (2021). Adoption of agricultural technology in the developing world: A meta-analysis of the empirical literature. *World Development, 146*, 1-16.

Saidan, N. H., Ridzuan Hamil, M. S., Kadir Pahirul Zaman, K. A., Azwanida Zakaria, N. N., Fadzil, N. S., & Muazzam Abdul Rahman, K. A. (2023). The Effect of Different Lignocellulose Biomass-based Substrates on the Enhancement of Growth, Yield, and Nutritional Composition of Grey Oyster Mushrooms. *Pertanika Journal of Tropical Agricultural Science*, *46*(3), 783-797.

Sakinah, N., Misran, A., Mahmud, T. M., Abdullah, S., & Azhar, M. (2020). Evaluation of storage temperature, packaging system and storage duration on postharvest quality of straw mushroom *(Volvariella volvacea*). *Food Research*, *4*(3), 679-689.

Advanced International Journal of Business, Entrepreneurship and SME's
EISSN: 2682-8545
AIJBES
Volume 7 Issue 24 (June 2025) PP. 362-386
DOI 10.35631/AIJBES.724024

Salam, M., Jamil, M. H., Tenriawaru, A. N., Kamarulzaman, N. H., Syam, S. H., Ramadhani, A., Bidangan, A. M., Muslim, A. I., Ali, H. N. B., & Ridwan, M. (2024). The effectiveness of agricultural extension in rice farming in Bantaeng Regency, Indonesia: Employing structural equation modeling in search for the effective ways in educating farmers. *Journal of Agriculture and Food Research*, *18*, 1-13.

Sazali, A. H. A., Kamarulzaman, N. H., & Man, N. (2024). Exploring the Factors Influencing Shrimp Farmers' Adoption Intentions toward Improved Disease-Prevention Technologies. *AGRARIS: Journal of Agribusiness and Rural Development Research*, *10*(1), 1-18.

Shariff, S., Katan, M., Ahmad, N. Z. A., Hussin, H., & Ismail, N. A. (2022). Towards achieving long-term agriculture sustainability: A systematic review of Asian farmers' modern technology farming behavioral intention and adoption's key indicators. *International Journal of Professional Business Review, 7*(6), 1-52.

Shitaye, Z., Tadesse, B., & Enkuahone, K. (2024). Sources and intensity of access to agricultural information technologies by smallholder farmers: evidence from Northwest Ethiopia. *Frontiers in Sustainable Food Systems*, *8*, 1-16.

Tabachnick, B. G., & Fidell, L. S. (2001). *Using multivariate statistics* (4th ed.). Allyn & Bacon.

Ten, S. T., Krishnen, G., Khulidin, K. A., Tahir, M. A. M., Hashim, M. H., & Khairudin, S. (2021). Automated controlled environment mushroom house. *Advances in Agricultural and Food Research Journal*, *2*(2), 1-12.

Ukundwanayo, D., & Rulinda, E. (2024). Effect of Project Management Information System on Projects Performance in Rwanda: A Case Study of New Life Women's Development Project. *East African Journal of Business and Economics*, *7*(2), 431-448.

Venkatesh, V., Morris, M. G., Davis, G. B., & Davis, F. D. (2003). User acceptance of information technology: Toward a unified view. Management Information Systems Quarterly, 27(3), 426–478.

Zahid, M., Barua, S., & Haque, S. (2012). Proximate composition and mineral content of selected edible mushroom varieties of Bangladesh. *Bangladesh Journal of Nutrition, 22*, 61-68.

Zhang, X., Yang, Q., Al Mamun, A., Masukujjaman, M., & Masud, M. M. (2024). Acceptance of new agricultural technology among small rural farmers. *Humanities and Social Sciences Communications*, *11*(1), 1-17.

Zhou, T., Lu, Y., & Wang, B. (2021). Social influence on the adoption of mobile payment technology. *Electronic Commerce Research and Applications, 48*, 1-19.