Understanding Fertigation Adoption: An Investigation into the Theory of Planned Behaviour among Indigenous Communities in Perak, Malaysia

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ABSTRACT

The *Orang Asli* Resettlement Programme (RPS) aimed to uplift the indigenous community, particularly in the *Titiwang* Range area of Perak. Despite socio-economic development projects under the RPS, poverty persists among the indigenous people, and conventional farming practices persist. They also refuse to implement fertigation technology due to negative perceptions of fertigation technology. This study aims to determine the relationship between attitudes, subjective norms, and perceived behaviour control towards fertigation technology among indigenous people in Perak. This study adopted a quantitative survey design conducted in Perak, Malaysia. A sample size of 150 indigenous people in Perak was selected as the respondents through purposive sampling. The collected data was subjected to descriptive and correlation analysis using Statistical Package for the Social Science (SPSS) version 26. The findings showed that there is a significant relationship between attitude (r=0.776, p=0.000), subjective norm (r=0.591, p=0.000) and perceived behavioural control (r=0.726, p=0.000) with the perception of indigenous people towards fertigation systems. The study recommended increasing agriculture-related programmes, particularly training initiatives, by organisations such as MUHAMMAD KAMALHAMDI BIN NAZAN (IMS ADA, EXCEL XDOP) JAKOA, DOA and non-profit organisations to improve indigenous technical training.

Keywords: indigenous people, fertigation technology, adoption, perception, TPB

INTRODUCTION

Orang Asli are the indigenous people of Malaysia. The total indigenous population of Peninsular Malaysia is estimated at 178,000. The *Orang Asli* Resettlement Program (RPS) is one of the preliminary efforts by the government towards the advancement and development of the indigenous community in Peninsular Malaysia [1]. It was officially launched in 1980 as part of the 4th Malaysia Plan [2]. Perak was the first state to implement the *Orang Asli* RPS, with a focus on the *Titiwang* Range area, as this was a communist concentration area [3]. The RPS program was later expanded to other states, such as Kelantan, Pahang and Johor, with a total 17.

The indigenous peoples of Malaysia have a deep respect for the land. Their agricultural wisdom is based on respecting the land. For them, the land is a shared treasure passed down from generation to generation. In

most states in Peninsular Malaysia, the government has allocated 1420.85 hectares of land to indigenous peoples for agricultural purposes, which is 92.48% of the total land in the states [4]. Under RPS, socio-economic development projects such as rubber plantations, fruit orchards, short-term crops, animal husbandry, freshwater fish farming, rattan and bamboo industries and the establishment of cooperative shops have also been planned to improve the standard of living of its participants [5] [1]. Implementing a large-scale development programme will undoubtedly benefit many aspects of indigenous people's lives.

Improving agricultural productivity is vital to promoting sustainable livelihoods and reducing rural poverty [6] [7]. Therefore, the adoption of technologies, like fertigation technology, can increase yields and farm incomes. Fertigation is applying fertilizer solutions with irrigation water, typically through a micro-sprinkler or a drip system [8]. Fertigation started commercially in the mid-20th century [9]. This practice aims to conserve reclaimed water; it has the potential to reduce nutrient leaching and subsequent groundwater contamination [10].

Under RPS, although the programme has a good purpose, it does not have a satisfactory effect where these minorities are still mired in poverty [11] [12] [1]. Many researchers have recognised poverty among indigenous peoples as a key issue [13] [14]. Besides, most indigenous people are not interested in agriculture technology and still implement conventional farming. They refuse to implement fertigation technology due to negative perceptions of fertigation technology. Besides, some studies found that indigenous people's knowledge of some products and services is still limited [15]. This is also applied to the new technology in the agriculture industry. Therefore, this study aims to determine the relationship between attitudes, subjective norms, and perceived behaviour control towards fertigation technology among indigenous people in Perak. The government aims to reduce poverty levels and income disparity among Malaysians, as stated in Focus 5. This study can also help the government achieve Malaysia's 12th Plan, locally known as "*Rancangan Malaysia Kedua Belas*" [16].

LITERATURE REVIEW

Perception is a person's ability to detect and evaluate sensory information. It also includes how a person responds to that information [17]. In agriculture, a farmer's perception is crucial as it significantly influences the adoption and implementation of that practice. A farmer's perception directly affects various aspects like the effectiveness of the practice, the overall productivity of the farm and the sustainability of farming practices. Furthermore, the farmer's attitude and understanding of a particular practice can influence the willingness to invest time, resources and effort in implementing it, ultimately determining whether the agricultural enterprise succeeds or fails.

Previous studies have shown that awareness of the impact of using chemical fertilisers, one of the modern agriculture techniques, is still low due to the lack of regular training opportunities. However, the demand for food is high [18]. Meanwhile, [19] also found that 94% of the farmers did not use agricultural technologies, like irrigation systems, on their farms due to the high cost of installing the systems, lack of knowledge and operational problems. This could be due to low perceptions of agricultural technologies that could increase agricultural production besides reducing time. [20] also noted a low perception of agricultural technologies among smallholder farmers due to the economic risk that the technologies could pose to farmers. It is therefore important to study indigenous peoples' acceptance of new technologies, as this directly affects their ability to reap the benefits of innovation, improve their livelihoods and adapt to changing socio-economic and environmental conditions.

THEORETICAL FRAMEWORK OF THE STUDY

According to [21], the Theory of Planned Behaviour (TPB) is a concept used to improve the predictive

power of the Theory of Action, which includes perceived behavioural control. The theory states that three core components, namely attitude, subjective norms and perceived behavioural control, together shape an individual's behavioural intentions (See Figure 1). This theory states that motivation and ability influence a person's behavioural performance.

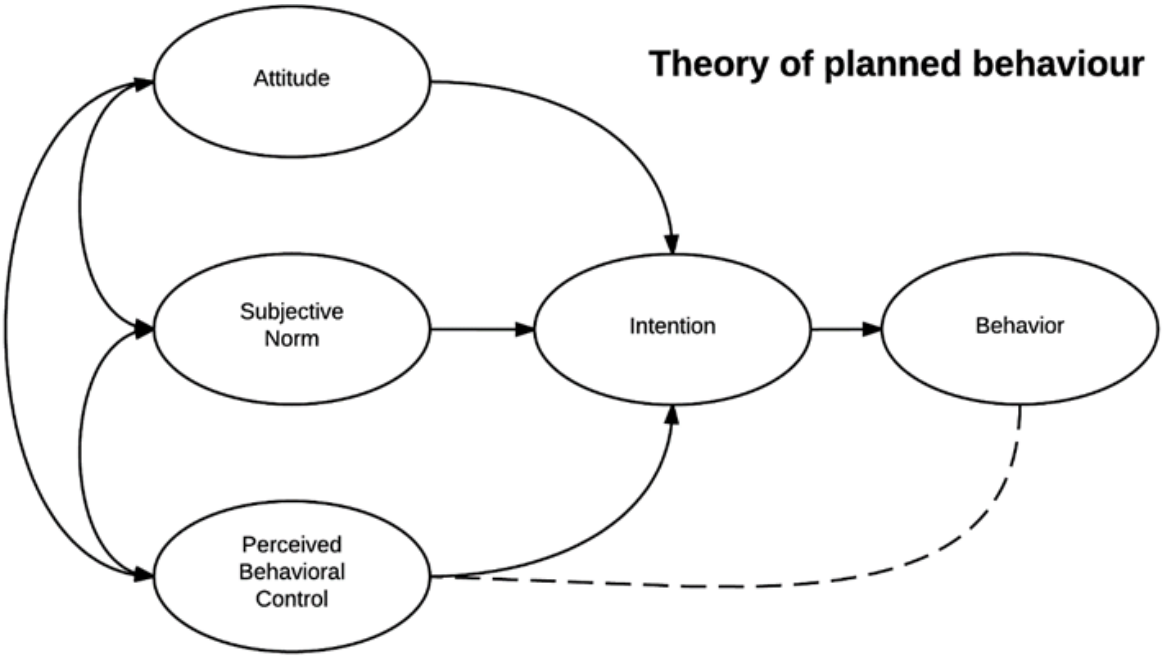

Figure 1: Theory of Planned Behaviour

Source: [21]

Attitude

Attitude, a key construct in the Theory of Planned Behaviour, represents a person's control over behaviour [22]. It is influenced by factors such as personality and societal effects. In agriculture, attitude towards agricultural technology is related to farmers' belief that cost saving affects their acceptance of the technologies [23]. [24] reported that the attitude of cotton farmers towards agricultural technology is at a moderate level as they realise the importance of the system for their agricultural production. Meanwhile, [25] found a high level of attitudes towards agricultural technologies, as they recognised the limited neutral resources and the importance of water. A farmer's positive attitude towards a particular farming practice may enhance their perception of associated sensory information, such as changes in soil quality or crop growth. A study by [23] revealed a positive relationship between farmers' attitudes and the adoption of fertigation systems, with farmers perceiving benefits such as reduced labour, reduced cost and increased production, especially when adopting advanced techniques.

Subjective Norm

The subjective norm represents a person's perceived social pressure. It is influenced by personal judgement and cognitive processes. [26] highlighted that other people's opinions can affect a person's acceptance of new technologies in agriculture. The subjective norm is an important determinant of farmers' intentions to adopt modern farming technologies [27]. [28] reported moderate subjective norms towards any agricultural technology due to the extensive network of people using the same technology. [29] found that subjective norms positively influence intention in a particular environment. In line with [26], subjective norms positively influence the adoption of new agricultural technologies in Malaysia. This study focuses on peer pressure and the opinions of others regarding adopting fertigation systems or other modern technologies in

the plantation area among indigenous people.

Perceived Behaviour Control

Perceived behavioural control represents an individual's actual control over behaviour. It also reflects an individual's assessment of the difficulty of performing a desired behaviour. It varies across situations and actions, so a person's sense of behavioural control changes depending on the scenario. PBC is derived from one's capabilities, resources and opportunities [30]. As highlighted by [26], perceived behavioural motivation is the main factor influencing farmers' use of the fertigation systems. They reported that perceived behavioural control significantly influences the use of modern technologies, emphasising its importance in shaping behavioural intentions. Then, [28] indicated that the level of perceived behavioural control toward agricultural technology is moderate due to previous experience with less complex agricultural technology. Meanwhile, [27] found lower levels of perceived control in agricultural technology adoption with a weak positive correlation with education.

METHODOLOGY

This study adopted a quantitative survey design conducted in Perak, Malaysia. Perak state was chosen due to its strategic position. It is located in the *Titiwangsa* Mountain range, predominately inhabited by most indigenous communities. In this study, the purposive sampling method was used due to its effectiveness when a certain number of people serve as primary data sources for the research design and the study's objectives. Not only that, but this method is also money- and time-saving [31]. A sample size of 150 indigenous people in Perak was selected as the respondents out of the total of 53,299 indigenous people [11], as recommended by [32]. Primary data was collected using structured questionnaires with a 5-point Likert scale. The questionnaire contained several parts, which were Part A (socio-demographic profiles of the respondents), Part B (the perception of indigenous people toward fertigation technology), Part C (indigenous people's attitude towards fertigation technology), part D (indigenous people's subjective norm, towards fertigation technology) and part E (indigenous people's perceived behavioural control towards fertigation technology).

The dependent variable of this study is indigenous people's perception of the fertigation technology. In contrast, the independent variables are attitude, subjective norm and perceived behavioural control of the respondents (see Figure 2).

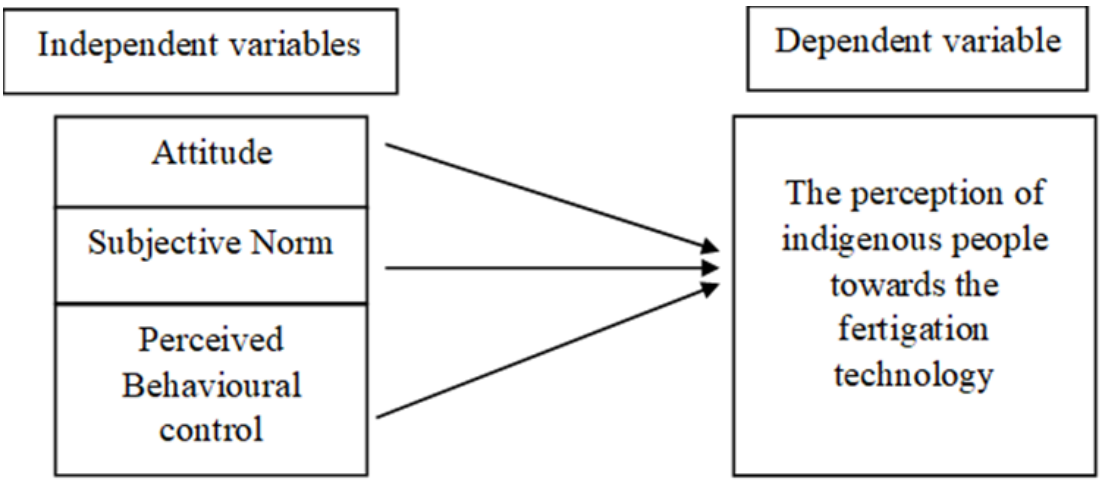

Figure 2: Research Framework

Adapted from: [21]

A pilot test was performed to assess the reliability and consistency of a measurement. The pre-test was carried out with 30 indigenous people in Perak. The results of the reliability test are shown in Table 1. Based on the table below showed that all Cronbach's Alpha values were more than 0.9: perception (0.979), attitude (0.962), perceived behavioural control (0.953), and subjective norm (0.953).

Table 1: Reliability Test of the Instruments

Variables	Cronbach's Alpha	Number of Items
Perception of Fertigation Technology	0.979	7
Attitude	0.962	8
Subjective Norm	0.943	7
Perceived Behavioural Control	0.953	7

Data obtained were subjected to descriptive and correlation analysis using Statistical Package for the Social Science (SPSS) version 26 to analyse the relationship between attitude, subjective norm and perceived behavioural control with the perception of indigenous people in Perak toward fertigation technology.

RESULT AND DISCUSSION

Socio-demographic Profiles of the Respondents

Table 2 shows the socio-demographic profiles of the respondents. In this study, female respondents (53.3%) were the majority compared to male respondents (46.7%). Most of the respondents were aged between 40 to 59 years old (52.7%), followed by 20 to 39 years old (38.0%) and 60 to 79 years old (9.3%). Next, most of them were married (66.0%), followed by single (24.0%) and widows (10.0%). For education level, many of them do not go to school (43.3%), followed by completed secondary school (30.0%), primary school (16.0%), Diploma (6.0%) and technical certificates (4.7%).

Table 2: Socio-demographic Profiles of the Respondents

Socio-demographic Profiles	Frequency	Percentage (%)
Gender		
Male	70	46.7
Female	80	53.3
Age (years old)		
20-39	57	38.0
40-59	79	52.7
60-79	14	9.3
Marital Status		
Married	99	66.0
Single	36	24.0
Widow	15	10.0
Education level		
No School	65	43.3

Primary School	24	16.0
Secondary School	45	30.0
Technical Certificated	7	4.7
Diploma	9	6.0
Total	**150**	**100.0**

The Relationship Between Attitude, Subjective Norm and Perceived Behaviour Control with Perception of Indigenous People Towards Fertigation Technology

Table 3 shows the results of the relationship between attitude, subjective norm and perceived behavioural control with the perception of indigenous people towards fertigation technology. The correlation coefficient measures the strength (direction and magnitude) of the association or relationship between two variables. The rule of thumb was used, as shown in Table 3, to interpret the magnitude of the correlation coefficient.

Table 3: Rule of Thumb for Interpreting the Size of a Correlation Coefficient

Size of Correlation	Interpretation
0.9 to 1.00 (-0.90 t0 -1.00)	Very high positive (negative) correlation
0.70 to 0.90 (-0.70 to -0.90)	High positive (negative) correlation
0.50 to 0.70 (-0.50 to -0.70)	Moderate positive (negative) correlation
0.30 to 0.50 (-0.30 to -0.50)	Low positive (negative) correlation
0.00 to 0.30 (0.00 to -0.30)	Negligible correlation

Source: [33]

Table 4 showed that attitude had a high positive correlation with the perception of indigenous people towards fertigation technology in Perak (r=0.776, p=0.000). This indicates that most respondents perceived adopting fertigation technology because they believe that the adoption is important for their farm and would benefit them. The more positive the attitude towards fertigation, the more likely it will be adopted. A study by [33] found that farmers' attitudes are significant as an influential determinant of farmers' intention to adopt sustainable agriculture. A farmer's attitude determines the strength of the farmer's commitment to specific farming practices [34] and is the most important factor influencing behavioural intention [35].

Besides that, this study found a significant (r=0.591, p=0.000) relationship between subjective norms and the perception of indigenous people toward fertigation technology in Perak with a moderate positive correlation. This suggests that subjective norms influence indigenous perceptions of fertigation technology in their social environment. [29] found that subjective norms could positively influence a person's intention to behave in a particular setting. Meanwhile, [26] reported that subjective norms positively influence the usage of new technologies in agriculture in Malaysia.

The findings also showed a significant (r=0.726, p=0.000) relationship between perceived behavioural control and the perception of indigenous people towards fertigation technology. The correlation was positive and highly correlated. This finding was aligned with the study of [36], who found that perceived behavioural control like naturalness is correlated positively with handling agriculture technology and pleasantness while managing the technology. [37] also reported that farmer's perceived behavioural control had a strong overall effect on the behaviour of using Good Agricultural Practices (GPAs), which means that many of today's environmental problems are directly and indirectly caused by people's daily behaviours, including perception.

Table 4: Spearman Rank Coefficient (rs) For the Correlation Between Education Level, Attitude, Subjective Norm, Perceived Behavioural Control with Perception of Indigenous People Towards Fertigation Technology

Variables	Perception of Indigenous People Towards Fertigation Technology
Attitude	0.776**
Subjective Norm	0.591**
Perceived Behavioural Control	0.726**

***Significant correlations at p<0.01*

CONCLUSION AND RECOMMENDATION

It can be concluded that there was a significant relationship between attitude (r=0.776, p=0.000), subjective norm (r=0.591, p=0.000), and perceived behavioural control (r=0.726, p=0.000) towards the perception of indigenous people in Perak towards fertigation technology. The study recommended that organisations such as JAKOA, DOA and other non-profit organisations should increase the number of agriculture-related programs, especially education-related programs where indigenous people can be more educated with new agriculture-related technology and have more exposure to new technologies in agriculture. For this study, the analysis could be improved by considering more specific aspects of indigenous education or literacy levels regarding their perceptions of adopting fertigation systems. Expanding the study to include indigenous populations in other states, such as Pahang, with a high indigenous population, would further enrich the scope and applicability of the findings.

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Ethical Standards

Not Applicable.

Disclosure Statement

The authors reported no potential conflict of interest.

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