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Factors Influencing Coconut Growers' Decision-Making Process in Fertilizer Application through the Lens of Theory of Planned Behaviour and Self-Determination

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Abstract

The small-scale, poor, rural coconut growers in Sri Lanka are generally characterized by low productivity. The low yield of coconuts is primarily attributed to the improper application of fertilizers. The decision to apply fertilizer is mainly depends on the growers' change in behaviour, in turn, influenced by the growers' salient beliefs. Assessing the beliefs plays a significant role in understanding why farmers behave differently in making decisions regarding fertilizer application. The Theory of Planned Behaviour (TPB) and Theory of Self Determination (TSD) were employed to find a more realistic solution to the above research problem. Hence, the current research was carried out to observe the relationship between the beliefs of the coconut growers and their behaviour with respect to fertilizer application in coconut fields. Results of the study reveal that perceived behavioural control was the highest contributor to developing the intention followed by the attitude. Further, there is no influence from the social pressure for the intention development. Moreover, intrinsic motivation predicts the fertilizer application behaviour from intention in stronger strength than that of extrinsic motivation. Therefore, it can be concluded that motivation influences the intention-behavioural relationship. Consequently, it gives evidence for policymakers to introduce policy guidelines in order to enhance the use of fertilizer efficiently and effectively. And, motivation does have a moderating effect on coconut growers' fertilizer application behaviour.

Key words: Attitude, Extrinsic-motivation, Intention, Intrinsic-motivation, Perceived behavioural control, Sri Lanka

Introduction

The coconut growers especially the small-scale, poor, rural farmers in developing countries are generally characterized by low productivity. A major contributory factor for the low production is the acute soil degradation arising due to the use of non-sustainable farming practices (Herath, 2016). Sri Lankan small-scale coconut growers do not practice applying fertilizer to their coconut palms. Amongst plenty of reasons, the high price of fertilizer is one of the main contributors to the non-application of fertilizer (Herath, 2016). According to Herath's study, 14% of the coconut growers were aware of the adult palm mixture (APM), and 13% of the coconut growers were only aware of the young palm mixture (YPM). Moreover, it was found that 31% of the coconut growers never applied fertilizer to their coconut estates. Accordingly, it is obvious that most of the coconut growers were neither in the practice of applying fertilizer to their coconut farms though it

has been one of the quickest possible ways to increase the yield nor they were aware of the importance of applying fertilizer to their coconut lands.

The main factors that influence growers' fertilizer application behaviour vary according to their socio-economic conditions, beliefs, and attitudes, which may involve various decision stimuli (Herath, 2012). In turn, these stimuli vary according to the growers' beliefs, and attitudes. As a consequence, individual growers have their unique fertilizer application behaviour. In order to understand growers' actual behaviour of fertilizer application, it is necessary to explore how the growers' various decision stimuli give rise to a particular behaviour in fertilizer application. The present study aimed to identify factors that determine growers' fertilizer application, and examine the intention-behaviour relationship with respect to extrinsic and intrinsic motivations.

To evaluate growers' actual behavior regarding fertilizer application, various factors influence their decisions, including their goals, motives, emotions, government policies, and the availability of advisory services (Beedell & Rehman, 2000). The growers' decision variables and behaviour on fertilizer application could be explained well by the Theory of Planned Behaviour (TPB) (Ajzen, 2012). TPB helps to explain the growers' behaviour in terms of factors such as the growers' attitudes, social influences, and their ability to cope with problems encountered and opportunities available.

Literature Review

Theory of Planned Behaviour (TPB)

The theory of Reasoned Action (TRA) was initially developed by Ajzen and Fishbein in 1980 and suggested that human behaviour directly depends on a person's intention. In TRA, the intention is determined by two variables; attitudes, and subjective norms (SN). Later in 1991, Ajzen introduced an additional variable; perceived behavioural control (PBC) to increase the explanation power of the model, and developed a new theory; the TPB. In the theory, intention infers a person's readiness to accomplish a particular behaviour and is known as the motivation which is required for engagement in a given behaviour. The intention is the most significant predictor of the behaviour and is expected to be an immediate antecedent of that behaviour (Ajzen, 2002b). Moreover, to explain growers' decision-making process in the application of organic fertilizer, the TPB was 2 successfully used by Herath and Wijekoon in 2013 and 2021. A person's intention to accomplish a behaviour is a function of that person's attitude, SN, and PBC as presented in Figure 1 (Ajzen, 1991).

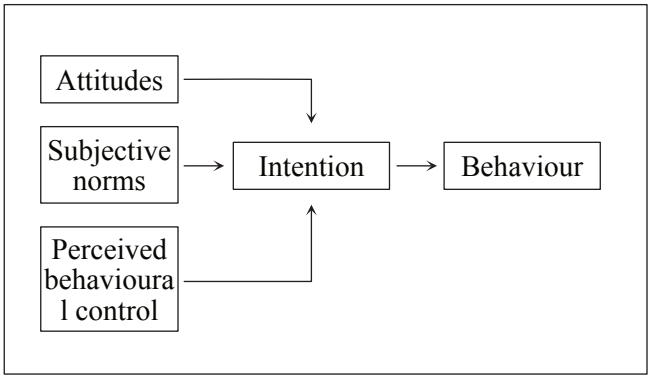

Figure 1. Diagram of Theory of Planned Behaviour (Ajzen, 1991)

Attitude is a person's positive or negative assessment of the performance of a specific behaviour (Ajzen & Fishbein, 1980). If an individual has a positive attitude towards a behaviour means that the individual trusts that important positive consequences would result from carrying out that behaviour. The attitude toward a behaviour is more favourable, and the possibility to perform a certain behaviour by an individual is very high (Ajzen, 2012). Further, several researchers found a significant positive association between growers' attitudes and intention or behaviour (Rezaei et al., 2019). Moreover, Savari & Gharechaee (2020) have emphasized the significance of attitude in predicting growers' fertilizer application behaviour.

A SN is an exerted social pressure on a person to perform a specific behaviour. People decide to implement a specific behaviour when they feel that the people who are important to them approve that behaviour (Ajzen & Fishbein, 1980). Results of previous studies where TPB was applied stated that the SN was the key factor affecting intention and behaviour (Arunrat et al., 2017). The same result was observed in the case of fertilizer application behaviours (Herath & Wijekoon, 2021; Savari & Gharechaee, 2020).

PBC could be defined as a person's perceived ease or difficulty of a specific behaviour performance. This factor highlights the degree to which a person perceives a behaviour to be under his/her volitional control (Ajzen & Fishbein, 1980). Behavioural control is related to beliefs about the presence of factors that may further or hinder the performance of behaviour (Ajzen, 2002b). Previous studies revealed the effect of PBC on intention (Mullan et al., 2013). Further, Savari & Gharechaee

(2020) applied the TPB in the context of agriculture to predict Iranian growers' intention for the safe use of chemical fertilizers, indicating that PBC was a significant factor affecting intention or behaviour.

The intention-behaviour gap was identified by (Ajzen, 2002a) who pointed out that the predictability of the model can be improved by incorporating other factors into the TPB, if they significantly contribute to the variance in intention or behaviour or intention-behaviour relationship (Ajzen, 2002b).

Self Determination Theory (SDT)

Self Determination Theory (SDT) is an empirically derived theory of human motivation and personality in social contexts that differentiates motivation in terms of being autonomous and controlled (Ryan & Deci, 2014). Examining the effects of extrinsic rewards on intrinsic motivation led to the development of the theory. Extrinsic-intrinsic classification is based on the degree to which motivation has been originated (Deci & Ryan, 2007). Perceived locus of causality (PLOC) is the key concept in SDT. The causes for a person's behaviour is measured by PLOC, and it ranges from externally to internally motivated behaviour (Deci & Ryan, 2007). Further, researchers used SDT and its mini-theories to guide and interpret research on many new issues, including motivation and wellness across cultures, close relationships, enhancement and depletion of energy and vitality, and the roles of both mindful awareness and non-conscious processes in behavioural regulation (Ryan & Deci, 2014). Several researchers have used the SDT for intrinsic and extrinsic motivation in several contexts to study their behaviour. Burton et al. (2006) examined Canadian students and revealed that intrinsic motivation was linked with psychological well-being, independent of academic performance. Tsai et al. (2008) evaluated German public school students' experiences of interest in three subjects. Therefore, SDT can be used as a supportive theory with TPB to assess the fertilizer application behaviour of the coconut growers in Sri Lanka.

Integrating a Moderator: Motivation

Motivation is the reason or reasons for one's behaviour. There are two types of motivations namely; intrinsic motivation (internal to the person), and extrinsic motivation (outside to the person). Intrinsic motivation refers to the behaviours done in the absence of external impetus that are inherently interesting and enjoyable (Miller et al., 1988). When individuals are motivated intrinsically, they engage, explore, and play in events for the integral challenge, excitement, and fun of doing so. Extrinsic motivation refers to the behaviours performed to obtain some outcome separable from the activity itself" (Miller et al., 1988). Moreover, SDT specifies four distinct types of extrinsic motivation that vary in the degree to which they are experienced as autonomous and that are differentially associated with classroom practices (e.g., autonomy-supportive versus controlling instruction) and learning outcomes (e.g., conceptual learning versus rote memorization) (Ryan & Deci, 2014). The previous studies on SDT suggested that both autonomous types of extrinsic motivation, and intrinsic motivation are favourable to engagement and explain the different behaviours, and perform as a moderating variable to explain the variance in the intention-behaviour gap. Chang & Wang (2011) applied motivation as a moderator to study the direct and indirect effects of retail environmental characteristics on impulse buying behaviour. Hence, the intrinsic and extrinsic motivation was integrated as a moderator to the conceptual framework.

To add new variables to the TPB framework, there are some requirements to be fulfilled (Ajzen, 2002a), thus, the causal relationship should be between the added variable and the behaviour. The motivations behind a behaviour and its origin are clearly explained in the SDT by Deci & Ryan (1985). This fulfils the Ajzen's first requirement, and therefore, motivation can be added as an additional moderator variable to the TPB.

According to the SDT, motivation is built upon three pillars; autonomy, and relatedness, competence, and is a unique concept. Autonomy represents a person's internal behaviour rather than external. Relatedness explains the relationships with society, and competence refers to the ability to do things successfully and effectively (Deci & Ryan, 2002). Further, the pillars in the motivation are as same as the variables in TPB. The SDT and the TPB explain the human psyche and fulfil the second requirement of Ajzen (1991), which is added variable should be a unique concept and suit the variables in the TPB.

Moreover, SDT basically differentiates four levels of motivation ranging from extrinsic to intrinsic motivation, and are measured by PLOC (Ryan & Deci, 2000). Ryan & Connell (1989) developed the Relative Autonomy Index which measures motivation and helps fulfil the third and fourth requirements of Ajzen (1991), pointing out that the added variable is exact, quantifiable and researchable.

The Conceptual Framework

TPB and SDT were combined to develop the conceptual framework. The integration of motivation into the TPB as a moderating variable will offer a more

complete view for the behavioural change. Motivation identifies factors that manipulate a person's behaviour, while TPB provides a framework to transfer beliefs into behaviour. Furthermore, adding motivation as a moderating variable to the standard TPB framework will enhance the intention-behaviour relationship. Likewise, it provides the answer to the behaviour of farmers towards fertilizer application decisions. Moreover, the theoretical framework of the study (Figure 2) was developed based on the above literature, and the hypotheses developed are;

H1: Growers' attitude has a positive significant effect on their intentions to apply fertilizer in coconut cultivation.
H2: Growers' SN has a positive significant effect on their intentions to apply fertilizer in coconut cultivation.
H3: Growers' PBC has a positive significant effect on their intentions to apply fertilizer in coconut cultivation.
H4: Growers' intrinsic motivation has a positive moderating effect on their fertilizer application intention-behaviour relationship.
H5: Growers' extrinsic motivation has a positive moderating effect on their fertilizer application intention-behaviour relationship.

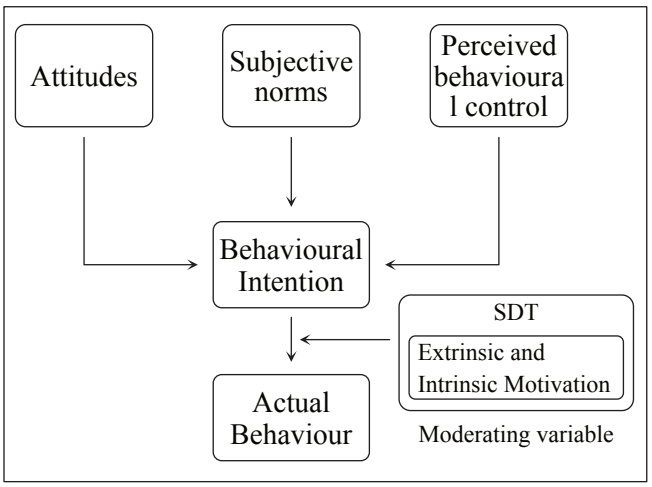

Figure 2. Integration of motivation into TPB model

Measuring Variables in Motivation

Connell and Ryan in 1989 developed the Relative Autonomy Index (RAI) to assess behaviour in academic-related work through motives. They identified four types of behavioural regulations namely; introjection regulation, external regulation, intrinsic motivation, and identification regulation. RAI respondents can be classified into Autonomous and Controlling groups (Ryan & Connell, 1989).

$$RAI = 2(Intrinsic) + 1(Identified) - 1(Introjected) - 2(External) \quad (1)$$

Measuring Variables in TPB

The expectancy-value method is widely used in behavioural studies to evaluate attitude. It quantifies, attitude by-product of belief and its evaluation. There are three basic elements in the expectancy-value method towards a behaviour to wit: belief (b), value (v) and attitude (a) (Viklund & Sjöberg, 2008).

$$a = \sum_{k=1}^{u} bivi \quad (2)$$

Based on the concept of TPB,

$$B \approx I \text{ œ } AT + SN + PBC \quad (3)$$

Where,
"B = Behaviour, I = Intention, AT = Attitude, SN = Subjective norm, PBC = Perceived behavioural control, bb = Behavioural belief, œ = Outcome evaluation, nb = Normative belief, mc= Motivation to comply, cb = Control beliefs, p = Power".

Therefore, a computable model of TPB can be given as;

$$B \approx I = \gamma_1 \sum_{i=1}^{s} bb_i oe_i + \gamma_2 \sum_{j=1}^{t} nb_j mc_j + \gamma_3 \sum_{k=1}^{u} cb_k p_k \quad (4)$$

Elicitation of the Salient Beliefs for TPB

Salient beliefs are developed in a person's mind when asked questions such as "What do you think would be the advantages for you to perform a certain behaviour?", and identified salient beliefs determine the respective attitude, SN, and PBC. The salient beliefs of a population could be identified by conducting an elicitation study (Gagné & Deci, 2005).

Materials and Methods

Identification of Salient Beliefs

According to Eccles et al. (2006), salient beliefs can be identified by conducting an elicitation study. An elicitation study was conducted in the coconut triangle (Kurunegala, Puttalum and Gampaha districts) of Sri Lanka with randomly selected 35 coconut growers in order to identify salient beliefs for the study.

Development of the Questionnaire

The questionnaire comprised of the recognized beliefs and indirect measures were used to assess the TPB variables; attitude, SN, and PBC. Further, variable attitude contained behavioural belief and outcome evaluation. The variable SN contained normative belief and motivation to comply. Finally, the control belief and power of control were the two components of PBC. Both had open-ended and close-ended questions. The close-ended questions were based on the 5-point Likert scale ranging from strongly disagree (1) to strongly agree (5). Further, for the negative items, the reverse coding system was followed.

Sampling Method and Study Area

Dillman (2007) pointed out that to represent around 30,000 of the coconut growers in the coconut triangle, 365 respondents were sufficient, but 425 respondents will be targeted to compensate for incomplete/unresponsive questionnaires. Therefore, the data were collected from 175, 150, and 100 growers who were selected using stratified random sampling technique from Kurunegala, Puttalm, and Gampaha districts respectively to represent the coconut cultivation extent.

Data Collection

Field surveys were conducted in the coconut triangle of Sri Lanka which covered the main coconut growing areas, and comprises Kurunegala, Gampaha and Puttlam districts. Data collection was done through face-to-face interviews using a self-structured questionnaire with coconut growers. The effective response rate was 86.8%, 82.6%, and 90% with 152, 124 and 90 duly completed questionnaires returned, respectively. Finally, the total sample size was 366, and regression analysis was done using SPSS version 26.0.

Results and Discussion

Socio-Economic Characteristics of the Respondents

The summary of the socioeconomic characteristics of coconut growers in Gampaha, Kurunegala, and Puttlam districts is given in Table 1. The average age of growers in Gampaha, Kurunegala, and Puttlam districts were 59.5, 58.2, and 55.2 years, respectively. The majority of the growers were male. The coconut growers in Gampaha district have a higher educational background than Kurunegala, and Puttlam districts. With regard to the time involved in farming, the majority of growers in Gampaha, and Putlam districts were part-time growers, while majority of growers in Kurunegala were engaged in full-time farming. The average farm size of Puttlam district (17.4 ac.) was greater than Kurunegala (14.1 ac.), and Gampaha (4.3 ac.) districts.

Table 1. Socio-economic Characteristics of the Respondents

Characteristics	Gampaha	Kurunegala	Puttlam
Mean Age (Years)	59.5	58.2	55.2
Education (No. of years) (Mean)	12.2	12.0	11.2
Gender (M/F ratio) (Male)	90.40%	87.00%	80.69%
Involvement in farming			
Full time	23.84%	57.50%	28.58%
Part Time	76.16%	42.50%	71.42%
Farm size (ac) (Mean)	4.3	14.1	17.4

Reliability Analysis

The questionnaire was pre-tested to ensure validity and reliability. The Cronbach's alpha values for the questionnaire items were above 0.6, hence, values were within the acceptable range (Flury et al., 1988) with higher reliability.

Table 2. Reliability Analysis Results of the Variables

No.	Variable	Cronbach's alpha
1	Behavioural beliefs of fertilizer application	0.784
2	Normative beliefs of fertilizer application	0.856
3	Control beliefs of fertilizer application	0.711
4	Outcome evaluation	0.752
5	Motivation to comply	0.751
6	Power of control beliefs	0.672

Relationship between Intention and TPB Components

Table 3 explains the relationship of the attitude, SN, and PBC with the intention. Attitude and PBC explicate the intention significantly with positive relationships. The beta values are 0.29 ($p = 0.03$), and 0.37 ($p = 0.001$), respectively. The SN did not predict the intention ($p = 0.317$) implying that only attitude and PBC predict the intention to apply fertilizer while SN does not.

Table 3. Relationship of TPB Variables and Intention

TPB Variables	Dependent variable	Beta value	Significance
Attitude	Intension	0.29	0.03
Subjective Norm	Intension	0.12	0.317
Perceived Behavioural Control	Intension	0.37	0.001
R^2 value		42%	
F - statistics		15.18 (P < 0.003)	

The Link between Intention and Behaviour

The intention-behaviour relationship was assessed under intrinsic and extrinsic motivation separately. It was expected that when motivation is intrinsic, individuals are predicted to continue engaging in the behaviour and exhibit steady motivation. When the motivation is extrinsic, people are expected to keep engaging in the behaviour as long as the extrinsic motivation is in effect. When the motivated force is withdrawn, its effects cause changes in motivation resulting in changes the behaviour (Chatzisarantis & Biddle, 1998). If these considerations are held then motivation is expected to moderate the intention-behaviour relationship.

In order to test the moderating effect of motivation on the intention-behaviour relationship, RAI of the SDT was utilized to split the sample (366 respondents) into two groups namely: (a) controlled behavioural group (extrinsically motivated) with 274 respondents, and (b) autonomous behavioural group (intrinsically motivated) with 92 respondents. Four questions were asked to identify the motivation type of the farmers to measure (a) external regulation, (b) intrinsic motivation, (c) introjected regulation, and (d) identified regulation. Table 4 displays the mean value of the Likert scale of each type of motivation.

Table 4. Types of Motivation

Types of motivation	Mean Value in Likert Scale	Standard Deviation
External regulation	3.9	0.86
Introjected regulation	3.8	0.91
Identified regulation	2.7	0.76
Intrinsic motivation	2.1	0.84

The regression analysis was carried out separately to predict behaviour from intention under two forms of motivation. Table 5 shows that the coefficient (Beta value) of the intention-behaviour relationship differs across the groups. The model for intrinsic motivation was significant.

Table 5. The Relationship of Intension vs. the Behaviour

Independent variable	Dependent variable	Beta value (Intrinsic motivation)	Beta value (Extrinsic motivation)	Significance
Intension	Behaviour	0.68		0.000
R^2 value		43%		
F - statistics			23.43 (p <0.000)	
Intension	Behaviour		0.26	0.005
R^2 value			29%	
F - statistics			15.18 (p < 0.001)	

The attitudes showed a statistically significant contribution to explain the intention to apply fertilizer, and hence, hypothesis H1 was accepted. Further, attitude covers the beliefs that spontaneously come from their own feelings. Consequently, attitudinal appraisals are associated with intrinsic outcomes like satisfaction, enjoyment, interest, and self-improvement. Moreover, attitudinal appraisals are also associated with extrinsic outcomes like rewards and money. In the farming context, it is the desire for higher yield and profits. Therefore, farmers' intention to apply fertilizer is a result of attitudes they have held for a long time. Consequently, attitudes have a greater weight in explaining intention development. Results from previous studies by Bondori et al. (2018), Rezaei et al. (2019), and Savari & Gharechaee (2020) showed that the attitude had a significant association with the growers' intentions to apply agrochemicals.

Interestingly, there was no statistically significant association between SN and the intention to apply fertilizer. Therefore, the hypothesis H2 was rejected. When considering the cost of production in coconuts, the highest cost factor is the application of fertilizer. Though social pressure affects fertilizer application, growers make their own decisions. Furthermore, the result is in line with the study of Terano et al. (2015), indicating that SN had no significant association with the growers' intentions to apply fertilizer.

The PBC showed a statistically significant contribution to explain the intention to apply fertilizer with a strength of 0.37 (p = 0.001). It shows the highest strength to explain the intention, the PBC contributes greatly to developing intention for fertilizer application, hence, the hypothesis H3 was accepted. The present

finding was supported by the results of the studies conducted by Terano et al. (2015), Han (2015) and Savari & Gharechaee (2020).

When considering intrinsic motivation, the significant F value of 23.43 (p = 0.001), indicated that hypothesis H4 was accepted. The beta value explains the vigor of the intention and behaviour with a strength of 0.68 (p = 0.000). The model fit R2 value of 43% indicates the variance of the intrinsic motivation on the intention-behaviour relationship contributed to the coconut growers' fertilizer application decision-making process.

When considering the extrinsic motivation, the significant F value of 15.18 (p = 0.001), implied that hypothesis H5 was accepted. The intention-behaviour relationship had a coefficient of 0.26 (p = 0.000), which explains the vigor of the intention. The related R2 value of 29%, explained that only 29% of the variance of the extrinsic motivation on the intention-behaviour relationship contributed to the coconut growers' fertilizer application decision-making process.

Results showed that the types of motivation affect the predictive validity of intention. Further, both extrinsically motivated and intrinsically motivated individuals show a positive significant correlation between intention and behaviour. A significant quantity of evidence proved that both intrinsically and extrinsically motivated people engaged in positive behaviour (Chatzisarantis & Biddle, 1998).

However, there is a comparatively stronger link between intrinsic motivation than that of extrinsic motivation. The intrinsically motivated group has greater strength to express behaviour than the extrinsically motivated group indicating that intention is important in predicting behaviour regardless of type of the behavioural regulation. Though the internal regulation explains with greater strength, it is evident that motivation had a moderate effect on coconut growers' behaviour. The results of the study conform with the earlier findings of Kulik et al. in (2008) where there is a stable and stronger link for the intention-behaviour relationship for internally motivated groups than that of externally motivated groups. People keep on a certain behaviour should an activity makes them happy as a result of an intrinsic motivation. Further, the intrinsically motivated group behaved in a particular way because the motivation comes spontaneously from their own feelings which is an indication of a stable behaviour. The findings of this study are compatible with Miller et al. (1988) findings that behavioural regulations are more vital in determining behavioural adherence.

Conclusion

The study aimed to identify types of motivation and their impact on coconut growers' decision-making on fertilizer application. It also offers a more comprehensive understanding of motivation with respect to growers' beliefs, attitudes, intentions, and behaviours in fertilizer application. Moreover, two TPB variables such as attitude and PBC showed a positive significant relationship with the coconut growers' intention to apply fertilizer. The integration of the TPB and the SDT provides a more vigorous understanding of behavioural intention. Furthermore, the model with empirical support explained the correlation between intention and behaviour with different motivational types. It provides information about what factors to consider when determining the coconut growers' behaviour in fertilizer application. These findings provide groundwork for policymakers to provide improved support to coconut growers.

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Conflict of Interest

The authors declare that there is no conflict of interest.

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