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Consumer Acceptance towards Aquaponic Products

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Abstract: *Aquaponic in Malaysia is considered as a new product category, which the product is the combination of aquaculture and hydroponic system. Since a lot of past studies have urged the need to understand consumer acceptance of new product, this study aims to understand how Malaysian consumer will response to this newly product- Aquaponic. To achieve the objective, this study used Theory of Plan Behavior whereby intention to purchase of Aquaponic products was used to understand the reception of Malaysian consumer towards Aquaponic products. The dimension of attitude (relative advantage and compatibility), subjective norm, perceive behavioral control (perceived knowledge and self-efficacy) and trust were examined. This study also investigated the effect of types of consumer (urban and rural consumer) as a moderator. A total of 390 respondents participated in this study with the use of closed-ended questionnaires. Findings indicated that relative advantage, compatibility, subjective norm, and perceived knowledge had significant relationship with purchase intention of Aquaponic products. It was also found that types of consumers did not have a moderating effect on Aquaponic acceptance. Therefore, the high intention among consumer to purchase Aquaponic products will significantly affect local aquaculture industry which aquaculture is well known for its environmental friendly business orientation.*

Keywords: *Aquaponic products, Consumer acceptance, Green products, Purchase intention, Theory of planned behavior*

I. Introduction

Nowadays, innovation of green product is highly demanded by consumers and green industries. Consumers who consume green products such as organic food believe the naturalness of the food are not affected. However, there is no clear consensus as to what food acceptability actually is. According to Radman (2005); Lea and Worsley (2008), food acceptability is about context-dependent behavior of human in response to food. For example, some consumers believed green product with low technology approach promotes health and environmental sustainability (Alibabic V., 2011). A previous study by Tobler, Visschers, and Siegrist (2011) claimed that among consumers in England sustainable consumption of green food includes consumer's belief, willingness and real behavior about green food consumption and it is important to the changes of consumer behavior towards the sustainable of environmental issues in England. In addition, green food consumption has become a global issue and is not an easy task (Spaargaren and Mol, 2008). Also, in Malaysia, green food products and environmental issues related to food planting, process and production have become common concern.

In regards of green products, Malaysian consumers have been exposed to green products such as foods, electronic appliance, and transportation. The government developed such campaigns such as 3R (reduce, reuse, recycle) and 'No Plastic Bag On Monday' as a way to support the environmental concern in terms of consumer consumption and lifestyle. However, a recent study conducted by Nor Azila Mohd Noor, Norsiah Mat, Nor Azwa Mat, Che Zurina Jamaluddin, Hayatul Safrah Salleh and Azli Muhammad (2012) has obtained negative results as green purchase behavior among Malaysian is found to be not encouraging. More importantly, it is also found that the findings of consumer acceptance towards green products are inconsistent whereby some studies found that the acceptance is high (Zagata, 2012; Ronteltap et al. 2007; Frewer, 2003; Saba and Vassallo, 2002; Siegrist, 2000) and some studies in the literature found that consumers are not willing to buy green products (Bukraba-Rylska, 2003; Bredahl, 2001; Sparks, Shepherd, and Frewer, 1994). Hence, it is important to understand the consumer acceptance towards Aquaponic products, especially in Malaysia when previous studies of consumer acceptance of Aquaponic products produce inconclusive findings.

1.1 Aquaponic products

In recent years, green product is one of the products which have placed either in local or in international market. In fact, there are many definitions and terms used to describe the question of 'what is green product' in the literature (e.g. Ottman, 1993; McDonagh and Prothero, 1997; and Peattie, 1992). According to Peattie (1992), the product is defined as 'green' when the product has significantly improved rather than conventional product in terms of the production process, consumption and disposal by concerning towards the environment.

Nowadays, aquaculture industries have stepped forward to enhance the productivity by justifying efficiency in aquaculture management. Efficient management in aquaculture leads to manage the waste and to restore the ecological relationship between humans, animal and plants (Rakocy, 2006). Thus, using the approach of combination between hydroponic and aquaculture in one recirculation system, Aquaponic aims for better waste management where it can use to plants and improve the water quality for aquatic animals live. According to Diver (2006), Aquaponic is combining the traditional way rearing of aquatic life in tanks and growing plants on the water, in a symbiotic sustainable environment. Aquaponic products such as vegetables and herbs can be planted using the Aquaponic system where the system can be developed in a low-cost system. For instance, Aquaponic system can produce a similar quantity of vegetables as what the conventional planting produced the vegetables. The vegetables are grown with nutrient supply by the fish waste. The roots from the vegetables are stripping off the ammonia, nitrates, nitrites, and phosphorus which contained in the fish waste. It is served as a liquid fertilizer to the vegetables to growth (Diver, 2006). However, the fish waste from fish tank will damage the environment if they are discharged directly into the river. The waste would become a 'food' for harmful bacteria in the water that will eventually create a 'red tide' which is dangerous for humans' life. Hence, this Aquaponic products are definitely categorized as a green product.

II. Literature Review

2.1 Conceptual Framework

Consumer's green behavior can be explained by using several theories. In this study, the Theory of Planned Behavior (Ajzen, 1991) is used to develop the framework. Previous studies had proven the efficiency of the Theory of Planned Behavior (TPB) framework in analyzing sustainable food (Vermeir et al., 2008) and green product consumption (Aertsens, Verbeke, Mondelaers and Van Huylenbroeck, 2009; Dean, Raats and Shepherd, 2008). In general, the theory composed of three independent determinants of behavioral intention, namely Attitude, Subjective Norm and Perceived Behavioral Control (Ajzen, 1991; 2003). Firstly, attitude towards a certain behavior is defined as the degree to which the behavior is positively or negatively evaluated with attitudes ranging from an unfavorable to a favorable evaluation of the focal stimulus. In this context of the study, it refers to the overall evaluation of green products namely 'Aquaponic'. Secondly, subjective norms are related to the social pressure perceived by a person who is related or close such as family and friends in deciding to engage with a certain behavior, belief, common expectations and desires. Finally, perceived behavioral control refers to the consumer's perception towards the ability of having the particular behavior. In this study, consumers may have a positive attitude towards Aquaponic, but they may be unable to simply accept the new product in the market because of lack of information that influences the level of knowledge (Venkatesh and Brown, 2001; Dwivedi, Choudrie and Brinkman, 2006; Ooi, Sim J.J., Yew and Lin, 2011).

In this study, the measureable of purchase intentions was the predictor of subsequent purchases and acceptance by the consumer. According to Mazar and Zhong (2010) justified that the consumer acceptance are related to consumer behavior where consumers are able to purchase the product because it is influenced by their intention. The researchers also suggested that performing consumer behavior into a green product emphasizes the need of researchers to investigate whether small or simple consumer behavior can be used as an indicator for acceptance. In this regard, Thøgersen and Noblet (2012) found that consumer acceptance are led by consumer behaviors to purchase the green products. Tan and Lau (2010) highlighted the importance of addressing the attitude-behavior gap by examining the acceptance of green products. Hence, consumer behaviors need to be understood to determine the acceptance of consumer (Costa-Font et al., 2008). Previous research has used consumer purchase intention as indicator of consumer acceptance. Venkatesh and Davis, (2000) constructed the purchase intention to examine consumer acceptance on green product. Therefore, this study aims to use the Theory of Planned Behavior (TPB) to develop a framework of consumer acceptance. Significantly, previous studies have used TPB to examine the consumer acceptance (Costa-Font and Gill, 2009; Chen, 2008; Han, 2006; Honkanen and Verplanken, 2004; Verdume and Viaene, 2003). Previous study by Zhu et. al (2013) found that consumers with high intention to purchase green product are tend to be more likely to adopt green food behavior in TPB. Thus, intention can be postulated to have three basic determinants such as attitude, subjective norm and perceived behavioral control (Ajzen, 2005).

2.2 Framework Development

The frameworks of this study address the three elements in TPB which is attitude, subjective norm, and perceived behavioral control. Two element such attitude and perceived behavioral control were strengthened by two dimension of variable. This study also developed a conceptual framework by adding trust in the independent variables and consumer intention to purchase as dependent variable. This study also investigated the effect of types of consumer (urban and rural consumer) as a moderator.

2.2.1 The Influence of Attitude towards Intention to Purchase Aquaponic Products

Previous studies indicated that consumer attitude is formed by the innovation characteristic (Frambach and Schillewaert, 2002; Le, Y., Hollenhorst, S., Harris, C., McLaughlin, W., Shook, W., 2006). However, not all innovation characteristic, as proposed by framework Rogers' (2003), were equally effect the attitude among the consumer. Arts J.W.C. et. al (2011) stated that there are some limitation to examine the effect of innovation characteristic in consumer attitude since lack of research on relative advantage and compatibility in innovation characteristic towards consumer acceptance. The relative advantage construct is designed to reflect consumer perceptions that all or certain of the attributes and qualities of the innovation can bring incremental value to the consumers compared to currently available alternatives. Relative advantage refers to the degree in which a potential adopter will gain or benefit from the adoption of a new innovation or using the product. In addition, relative advantage is commonly found in the literature, where it is often cited as the most significant in terms of the rate of acceptance. Relative advantage based on attributes and performance exists if a product has superior physical or technical attributes. These attribute-based advantages provide significant improvements over previous innovations making it unique and superior at meeting a specific need (Rogers, 2003). Economic advantage includes the initial cost of the item, as well as cost savings that might be realized if the new technology is less expensive for operation than the old one (Rogers, 2003, p. 230). Flight et al. (2011) has found that the relative advantage is designed to reflect consumer perception where all or certain of the attributes and qualities of the innovation can bring incremental value to the consumer compared to conventionally available products (Flight et al., 2011). In general, consuming conventional vegetables benefit the consumer while relative advantage is the additional value by taking Aquaponic vegetables rather than conventional vegetables. These attributes provide a significant improvement and meet similar need of consumer (Rogers, 2003). Based on the discussion, this study posit to first hypothesis.

H₁: There is a significant positive relationship between relative advantages and intention to purchase Aquaponic products.

According to Rogers' (1995, 2003), compatibility is defined as degree to which a new product or service is consistent with existing customer values, needs, and past experiences of potential adopters. In a way, Flight et al. (2011) in their study defines compatibility as the ability of product fitting in the consumers existing lifestyle and social structure. Rogers' explained that there are two sub-dimensions compatible if the product innovation fit to the consumer which is personal and social. According to Rogers (2003), the first dimension about personal is explained the consumer existing habits and lifestyle would be compatible with the innovation product. However, the personal compatibility is less when the consumer is needed to change their lifestyle to consume the innovation products. Second dimension is social compatibility which the product fits into social structure of the consumer. Rogers' stated the social structure compatibility could happen when the product innovation fit to the social expectation. Furthermore, Le et al., (2006) has agreed that compatibility can be extended to the social structure because the consumers not only review the product based on their previous experience, but the compatibility of the product could reflect to consumer's inner belief and value. Previous study by Chou, Chen, and Wong (2012) has investigated about green practice in restaurant industry in Taiwan. The study have been combined the innovation adoption theory with TPB which has included five perceived innovation characteristic proposed by Rogers (1995). The study has found that compatibility significantly affected the intention to purchase. Hence, this study posit to second hypothesis.

H₂: There is a significant positive relationship between compatibility and intention to purchase Aquaponic products.

2.2.2 The Influence of Subjective Norm towards Intention to Purchase Aquaponic Products

Ajzen (1991) defined subjective norm as 'perceived social pressure to perform or not perform the behavior'. In other words, a subjective norm is referring to someone who is related or closes with consumer to encourage or influence their behavior. . Kim, Ham, Yang, and Choi (2013) in their study postulated subjective norm as a normative belief which is social pressure from important references and influence consumer behavior

or action. Consumers believe that their behavioral intentions are influenced by family, friends, peers group, co-workers, colleagues, or business partner (Pavlou and Chai, 2002). A study in India showed that the subjective norm was particularly important to perform the consumer acceptance in their decision process (Choo, Chung, and Pysarchik, 2004). Even though subjective norm is one of the important antecedents in TPB, there is a gap of literature, highlighted the subjective norm as low significant with consumer intention. For an example, early study by Thompson et al. (1994) has found that subjective norm is a very weak factor in their study about consumer purchase intention. In addition, Patch, Tapsell, and Peter (2005) stated in their study about consumer intention of food consumption using TPB with significant attitude and perceived behavioral control towards intention except subjective norm, where it is very low significant. However, there were a number of previous researches had found positive relationship between subjective norm and intention (Pawlak and Malinauskas, 2008; Dean et al. 2008). A study conducted by Fila and Smith (2006) in urban native American using TPB approaches in their framework found subjective norm as a strong predictor of consumer intention to use the product. Hence, this study posit to the hypothesis three.

H₃: There is a significant positive relationship between Subjective Norm and intention to purchase Aquaponic products.

2.2.3 The Influence of Perceived Behavioral Control towards Intention to Purchase Aquaponic Products

Perceive Behavioral Control (PBC) explores the perceived facilitating and inhibiting effects of related factors, primarily to self-efficacy. In the context of green products acceptance, Taylor and Todd (1995) stated that consumer self-efficacy is one of the important factors in consumer acceptance. Furthermore, it is also suggested by Jeon, Han, K.S., Lee, (2006), to examine the effect of consumer perceived knowledge as a better explanation of intention to purchase a green product. Hence, this study will examine both perceived knowledge and self-efficacy as important factors of perceived behavioral control and their relationship with intention to purchase Aquaponic products. Thus, this study posits to hypothesis four and five.

In green products field, consumers do not have sufficient knowledge about the product. Generally, consumers are lack of knowledge about the process of the product where the product to be 'green' and can be called as 'organic' (Hoeftkens, Verbeke, Aertsens, Mondelaers, and Van Camp, 2009; Yiridoe, Bonti-Ankomah, and Martin, 2005). The knowledge about green product is still lacking where consumers rely on the given information on product label and product agent. However, consumers are aware about the importance of using green product and the affect by taking the product. The affect by taking green product is significant with environment and the additional value to the consumer. According to Makatouni (2002), consumers need more information as their knowledge to certify the product is fit to them. The information should be informed to them as a responsibility to the marketer for consumer supplementary knowledge. For instance, consumers realized the importance of knowledge about organic food features where the unhealthy food will harm their body (Beharrell and Macfie, 1991; and Hill and Lynchhaun, 2002). Demeritt (2002) documented that the basic reasons why American consumers are not buying organic food is because they are lack of knowledge. Thus, this study emphasized perceived knowledge as the important of information of consumer since this Aquaponic product is new product in the market and differs from the conventional way producing vegetables products.

H₄: There is a significant positive relationship between Perceived Knowledge and intention to purchase Aquaponic products.

Self-efficacy reflecting control perception is incorporated into most health behavior models in the prediction of health behavior (Jones F., Harris P., Waller H., Coggins A., 2006). According to Milne et al., (2009) self-efficacy is internal motivation where consumers are concerned to perform such particular behavior. Consumers have subjective judgment of their ability either they can perform the behavior or not. However, there are several researches have stated that self-efficacy are significant to consumer intention to perform such behavior with concerned to their health (Scholz, Sniehotta, Schüz, and Oeberst, 2005; Luszczynska, 2004; Scholz, Sniehotta, Schüz, and Oeberst, 2005). Nevertheless, Liu (2008) and Keller (2006) have stated that the behavior performed by the consumer is caused by the consequence after the action taken. For instance, the consumer has reduced their action which would affect the negative consequences. According to TPB (Ajzen, 1985; 1991) perceived behavioral control is referred to the performance of a behavior under consumer control, and it's often seen as synonymous with self-efficacy (Ajzen, 1998; Bandura, 2000). Moreover, self-efficacy is found to be one of the best predictors of health behavior intentions for certain health promoting behaviors (Milne and Orbell, 2000). Hence, this study hypothesized that:

H₅: There is a significant positive relationship between Self-Efficacy and intention to purchase Aquaponic products.

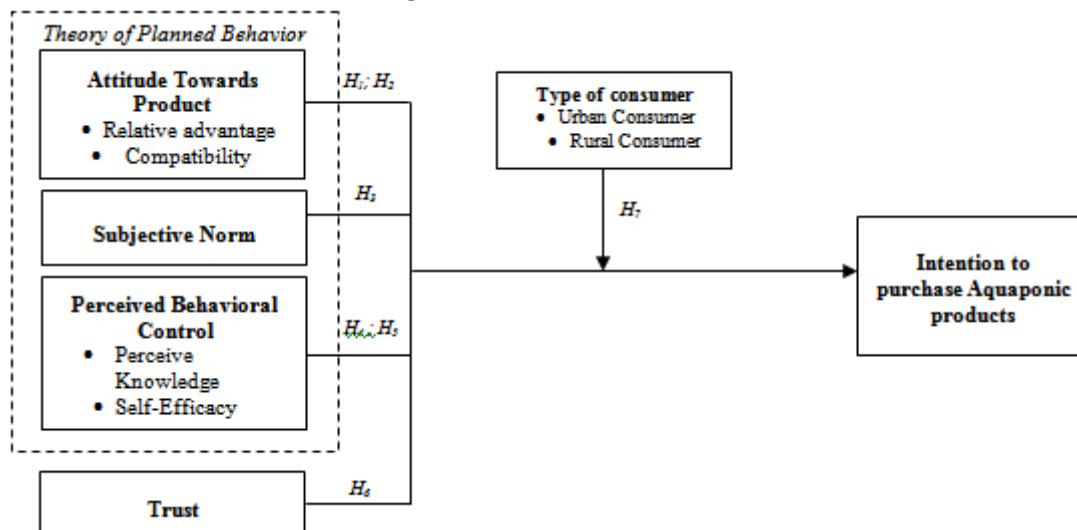
2.2.4 Trust

Trust can be defined as willingness to rely on an exchange in which one has confidence (Van der Heijden et al. 2003). Meanwhile, Mayer et al. (1995) defined trust as the willingness of a party to be vulnerable to the action of another party based on the expectation that the other will perform a particular action important to the trustee. Psychologists defined trust as an individual generalized expectation that the promise of another individual can be relied upon (Bart, Shankar, Sultan, & Urban, 2005).

The importance of trust derived the consumer to accept the product since they are lack of knowledge about the product and the product are new for them. Berg (2004); Green, Draper, and Dowler (2003); Siegrist and Cvetkovich (2000) highlighted trust to play important roles when consumers are not familiar and lack of knowledge about the product. The result shows that consumers are able to rely on their confidence of the product to the actor in the market such as the producer and authorities regulatory such as the government. Furthermore, Siegrist et al., (2008) consumer trust in the food industry is important when the consumers are not exposed about the product and influence their intention. McKnight (2005) has been stated that trust reflects to the willingness of the user to purchase the product. In addition, Xin Li (2004) state that trust is indirect variables where not included in TPB but it (trust) is a critically important to explain consumer intention. Therefore, people’s willingness to trust and how they build their trust towards intention to purchase are the keys to predicting consumer’s actual behavior.

H₆: There is a significant positive relationship between Trust and intention to purchase Aquaponic products.

Figure 1: The Research Model



2.2.5 Moderator effect of type of consumer on intention to purchase Aquaponic products.

Zhu et al., (2013) postulated the functional of moderator effect in their study of green product either the moderator will strengthen or weaken the relationship between the independent variables and dependent variables. In this study, the framework of TPB consists a moderator factor which is the type of consumer. Aertsens, J., Verbeke, W., Mondelaers, and Van Huylbroeck, G., (2009) suggested the use of a moderator within the framework using TPB to examine which factors influence the intention. Qaim (2009) showed a different type of consumer have different purpose to accept a new product. The consumers are influenced by their personal factor and some of them are induced by their economic factors such as income and cost of living. Study by Kikulwe et al., (2011) about genetically modified food showed the types of consumer are associated with the consumer willingness to purchase the genetically modified banana in Uganda. The type of consumer provides information to easily examine the characteristic and the intention of target consumers. Previously, Edmeades (2007); Edmeades and Smale (2006) stated that the types of consumers have contributed to the growth of the genetically modified banana to investigated the different behavior performed by the consumers. Nevertheless, McEachern and Warnaby, (2006); Oygard (2000); Weatherell, Tregear and Allinson (2003) have found the difference between urban and rural consumer in their attitude towards green products. The studies

conducted by Michaelidou and Hassan (2010) stated the importance of study about the urban and rural consumer which is understudied. The study on types of consumers has proven that differentiation existed between urban and rural consumer in their socio-economic demographic. Therefore, previous studies conducted by Loureiro and Bugbee (2005); Lusk, Jamal, Kurlander, Roucan, and Taulman (2005); and Gonza' lez, and Qaim (2009) examined the effect of the willingness to purchase by the types of consumers are influenced by their socioeconomic factors i.e. income, education, age, and household size. The researchers summarized that consumers are thinking differently based on their behaviors towards the products. Thus, this arrives at the following hypothesis:

H₇: Type of consumer (urban consumer and rural consumer) will moderate the relationship between six independent variable (relative advantage, compatibility, subjective norm, perceived knowledge, self-efficacy, and trust) and intention to purchase Aquaponic products.

III. Methodology

3.1 Sample and Data

The targeted population of this study consists of those who live in the urban and rural areas in Malaysia either they have purchased or they do not have experience with organic food. The location of study covers Kuala Lumpur, Johor Bahru, and Kota Kinabalu (Urban areas), while Kota Belud, Ranau, Parit Jawa, Ayer Hitam and Simpang Renggam (Rural areas). According to Ministry of Rural and Regional Development (2010), 65 percent of Malaysian lives in urban areas whilst 35 percent are in rural areas. Hence, this study employed the number of respondents by the ratio of urban and rural population given by Malaysia Ministry of Rural and Regional Development (2010). From total 390 respondents, 65 percent (251 people) of respondent were chosen from urban areas and 35 percent (139 people) of respondent were interviewed in rural areas. In addition, the respondent of this study was consumers who are twenty years and above is participated to answering the questionnaires of this study. According to [Chen \(2007\)](#), those aged twenty years and above are the food buyers in a family and they are exposed to green products such as vegetables.

Based on the collected data (Table 1), majority of the respondents were between the ages of 27 to 33 years with a total of 130 (33.3%) respondents. The second highest respondents are from the age 34 to 40 years old with 112 respondents (28.7%), and followed by 67 respondents between 41 to 47 years old (17.2%). There are 51 respondents aged 20 to 26 years old by representing 13.1 percent in total. Respondents from 48 years and above had a total of 30 respondents with the lowest percentage of 7.7 percent. The data shows the majority of the respondents are female, where the total numbers of female respondents are almost double the total of male respondents. The total numbers of female respondents are 239 (61.3%), whilst 151 respondents were male (38.7%). The larger group of respondents was Native Sabahans consisting of 170 respondents (43.6%). The second larger group of respondents was Malays with 128 respondents or 32.8 percent. Additionally, a total number of 59 respondents were Chinese (15.1%). Indian respondents were 25 or 6.4 percent, followed by 8 respondents from Native Sarawakians (2.1%). According to the data, majority of respondents were bachelor degree holder with 141 respondents representing 36.2 percent of the whole samples. Secondly, 101 (25.9 percent) respondents were STPM or Diploma holder. On the other hand, there were 81 respondents with SPM and Lower education level, which is 20.7 percent of total samples. As for Master and Others, it is 39 (10 percent) and 23 (5.9 percent) of respondents, respectively. Adding to this, only 5 respondents (1.3 percent) had Doctoral education and it comes to the lowest majority of education level qualification. Furthermore, based on the data, majority of respondent earned monthly income of RM1 001 to RM2 000, with 108 of respondents or 27.7 percent from the total. In addition, the second highest range of respondents were those received RM2 001 to RM3 000, which is 99 respondents or 25.4 percent. Thirdly, 79 of respondents were those who earned RM1 000 below which is 20.3 percent from total. On the other hand, there were 70 respondents who earned income between RM3 001 to RM4 000 which is 17.9 percent from the total respondents. This is followed by respondents who earned RM4 001 above with 34 of respondents or 8.7 percent.

Table 1: Profile of Respondent

Variables	Categories	Frequency	Percentage (%)
Age	20 – 26	51	13.1
	27 – 33	130	33.3
	34 – 40	112	28.7
	41 – 47	67	17.2
	48 – above	30	7.7
Gender	Male	151	38.7
	Female	239	61.3
Race/Ethnicity	Malay	128	32.8
	Chineses	59	15.1
	Indian	25	6.4

	Bumiputra Sabah	170	43.6
	Bumiputra Sarawak	8	2.1
Educational	SPM and lower	81	20.8
	STPM/Diploma	101	25.9
	Bachelor	141	36.2
	Master	39	10.0
	Doctoral	5	1.3
	Others	23	5.8
Income Level (monthly)	RM1 000 below	79	20.3
	RM1 001 – RM2 000	108	27.7
	RM2 001 – RM3 000	99	25.4
	RM3 001 – RM4 000	70	17.9
	RM4 001 above	34	8.7
Job Sector	Entrepreneur	58	14.9
	Government Staff	113	29.0
	Private Staff	144	36.9
	Others	75	19.2
Type of Consumer	Urban	251	64.4
	Rural	139	35.6

3.2 Questionnaires Design

The questionnaires was designed with reference to previous studies (Zhu et. al., 2013; Flight et. al., 2011; Christoph et. al., 2008; Jang et. al., 2011; and Tudoran et al., 2012). The questionnaire was divided into eight sections such demography and other variables include in this study (intention to purchase Aquaponic products, relative advantage, compatibility, subjective norm, perceived knowledge, self-efficacy, and trust). The questions were answer on consumer identification about their demography using the optional answer given in this section. Furthermore, the second section until last section was answered on a five point Likert scale 5 to 1 (high to low). The questionnaires are divided into two categories which is ‘A’ for urban respondent and ‘B’ for rural respondent. The provided screening question at the beginning of the questionnaires is to ensure this study targets only those who are twenty years old and above.

3.3 Questionnaire analysis and assessment of reliability and validity

The factor analysis was conducted in this study to determine the validity of data to obtain smaller sets of each variables and helping finding interrelated variable components. By that, the large number of variables can be summarizing into smaller number of factor. After the data has run, there three variables items are still remain with the original items such as intention to purchase, subjective norm and trust. However, the variables such relative advantage, compatibility, perceive knowledge, and self-efficacy has been change from five to four items, five to three items, five to four items, and four to two items, respectively.

Exploratory factor analysis with the VARIMAX rotation is used to identify the reliability of the independent variables and dependent variables, and also PATTERNMATRIX rotation is used to reliably identify the moderators.

Reliability analysis was carried out to measure the consistency of each variables resulted from factor analysis. The Cronbach’s Alpha for each variable ranged from 0.697 to 0.911. According to Hinton et al. (2004), a Cronbach’s Alpha over 0.90 denotes an excellent reliability, 0.70 to 0.90 denotes high reliability, 0.50 to 0.70 denotes moderate reliability and value below 0.50 denotes low reliability. Thus, all the variables for this study were deemed practical and acceptable (Table 2).

In this study, a five Likert scale (1 = Strongly Disagree to 5 = Strongly Agree) was used to measure each highlighted variables in this study. According to descriptive analysis, the results showed that mean score for each independent variables and dependent variable indicated that the mean value is 3.40 to 4.20. It indicated that respondents chose ‘moderate’ to ‘agree’ answer about their opinion towards Aquaponic products. In addition, the standard deviation for all variables was ranged from 0.52 to 0.70. Overall, Perceived Knowledge has the highest mean score of 4.20, with a standard deviation of 0.52. On the other hand, Subjective Norm has the lowest mean score of 3.40, with a standard deviation of 0.64.

Table 2: Descriptive and reliability statistic of the variables

Items	Mean	Factor loading	Standard deviation	Cronbach’s Alpha
Intention to purchase Aquaponic products				
I will buy Aquaponic vegetables to avoid illness since unhealthy food may hurt my health	3.96	0.855	0.6538	0.881
I will buy Aquaponic vegetables to guarantee my health	4.03	0.841		
I will pay more for Aquaponic vegetables for high quality of life	3.90	0.835		
I will buy Aquaponic vegetables as a responsible consumer	3.98	0.803		

I will buy Aquaponic vegetables to reduce environmental damage	3.81	0.786		
Relative Advantage I like Aquaponic vegetables because it is more reliable than other vegetables	3.88	0.829	0.5970	0.812
I like Aquaponic vegetables because it is more beneficial to eat than other vegetables	3.91	0.827		
I like Aquaponic vegetables because it enhance my healthy	3.81	0.756		
I like Aquaponic vegetables because it allows me to reduce costs	3.78	0.668	0.6681	0.753
Compatibility I favor Aquaponic vegetables because it's fit into any social class	3.69	0.840		
I favor Aquaponic vegetables to eat because it's socially acceptable	3.74	0.837		
I favor Aquaponic vegetables because it's fit into my existing lifestyle	3.74	0.679		
Subjective norm The government stimulates me to eat more Aquaponic vegetables	3.38	0.838	0.6402	0.878
Doctors think that I should eat Aquaponic products	3.23	0.817		
Nutritionist think that I should eat Aquaponic products	3.17	0.808		
My friends think that I should eat Aquaponic vegetables	3.66	0.799		
The food industry encourages me to eat more Aquaponic products	3.11	0.761		
My family thinks that I should eat Aquaponic vegetables	3.86	0.706		
Perceived Knowledge Consumer will compare product information labels of Aquaponic vegetables to decide which product to buy	4.07	0.819	0.5215	0.779
Consumers need to know what the Aquaponic vegetables contains	4.27	0.767		
The information of Aquaponic vegetables should be exposed	4.56	0.728		
Consumers are like to buy Aquaponic vegetables in specialty store where they can get expert	3.91	0.702		
Self-Efficacy I do not feel I will have difficulties to eat Aquaponic vegetables	3.46	0.856	0.7007	0.697
I have a confidence to eat Aquaponic vegetables	3.61	0.848		
Trust The government have sufficient knowledge to guarantee the safety of Aquaponic vegetables to eat	3.99	0.813	0.6152	0.911
The government gives special attention to the safety of Aquaponic vegetables to eat	4.04	0.805		
The farmers take good care of the safety of Aquaponic vegetables to eat	3.97	0.791		
The farmers give special attention to the safety of Aquaponic vegetables to eat	3.97	0.791		
The government takes good care of the safety of Aquaponic vegetables to eat	4.04	0.785		
The government have the competence to control the safety of Aquaponic vegetables to eat	3.99	0.776		
The farmers have the competence to control the safety of Aquaponic vegetables to eat	3.96	0.770		
The farmers have sufficient knowledge to guarantee the safety of Aquaponic vegetables to eat	3.92	0.760		

IV. Result

The research model was tested using the SPSS 21.0 for descriptive, correlation, reliability, and regression analysis. A total of 500 sets of questionnaires were distributed in the identified isolated study area which covered some locations such as shopping mall, recreation garden, residential area, and as well as government and private offices. However, only 475 sets of questionnaires were returned which is 95 percent from the total distributed questionnaires. After screening all the received questionnaires, only 390 sets of questionnaires were able to be used for the study. The respondents' profile is presented in Table 1.

The overall result of Pearson Correlation Analysis show a medium correlation between the dependent variables (Intention to Purchase) and independent variables (i.e Relative Advantage, Compatibility, Subjective Norm, Perceived Knowledge, Self-Efficacy, and Trust). The highest value of the correlation is 0.467 of subjective norm and intention to purchase, while the lowest value of correlation is self-efficacy which was 0.331. In the other hand, the remaining independent variables had a medium correlation in the highest range to the lowest range is Relative Advantage, Compatibility, Perceived Knowledge, and Trust where the value is 0.462, 0.458, 0.390, and 0.339 respectively (Table 2)

4.1 Hypothesis testing

4.1.1 Multiple regressions

By using multiple regression analysis (shown at Table 4.1), all the hypothesis 1 until 4 was accepted. Relative advantage beta value was at 0.239 which indicated a positive relationship between intention to purchase Aquaponic products, Thus, Hypothesis 1 was accepted. Furthermore, it was found that P value for compatibility was at 0.006, at the significance level ($P < .05$) and the Beta value at 0.152. Hypothesis 2 indicated a significance and positive relationship between intention to purchase Aquaponic products. Subjective norm P value was at 0.000, which proves that it was significance ($P < 0.001$). Also, the Beta value was 0.207 indicating a positive relationship between subjective norm and intention to purchase Aquaponic products. In the other hand, P value for the perceived knowledge was at 0.007 where it is significance at $P < 0.05$ while the Beta value was 0.136. Therefore, it is confirmed that perceived knowledge is significantly and positively towards intention to purchase Aquaponic products. In addition, P value for self-efficacy was at 0.871, which is more than 0.05 and Beta value was 0.008. Hence, it proved there is no significant relationship between self-efficacy and intention to purchase Aquaponic products. Lastly, P value for trust was at 0.576 and bigger than the acceptance value of 0.05. So, the hypothesized relationship between trust and intention to purchase Aquaponic products is not proven with Beta value is 0.029.

Table 4.1: Multiple Regressions for H₁, H₂, H₃, H₄, H₅, H₆

Model		Unstandardized Coefficients		Standardized Coefficient	t	Sig.
		B	Std. Error	Beta		
1	Constant	.803	.253		3.167	.002
	Relative Advantage	.261	.055	.239	4.788	.000
	Compatibility	.148	.054	.152	2.761	.006
	Subjective Norm	.211	.055	.207	3.806	.000
	Perceived Knowledge	.170	.063	.136	2.689	.007
	Self-Efficacy	.008	.048	.008	.162	.871
	Trust	.030	.054	.029	.560	.576
	R² = .342					
Adjusted R² = .331						
F Change = 33.137						
Sig F = .000						

4.1.2 Hierarchical Regression

A hierarchical multiple regression analysis (Table 5) was conducted to test either the dependent variable of intention to purchase are function of multiple predictor factor whether the moderator type of consumer moderates the relationship between the independent variables with intention to purchase Aquaponic products. As a results, $R^2 = 0.342$ (34.2 percent), F change = 33.137, and Sig. F change .000 = $P < .01$. In model two, types of consumer was introduced. However, the results indicated that intention to purchase Aquaponic products has no effect as moderator where the P value remained statistically significance, Sig F Change = .000 even though increase in $R^2 = .370$, R^2 Change = .028 or 2.8 percent and F Change = 17.247. In the final step of the regression analysis, an interaction term between independent variables and types of consumer was introduced (Model 3). The results showed the variance in intention to purchase Aquaponic products has increase where R^2 Change = .006, F Change = .559, and $P = .763$, bigger than significant value $P < .05$. Hence, types of consumer did not moderate the relationship between relative advantage, compatibility, subjective norm, perceived knowledge, self-efficacy, and trust and intention to purchase Aquaponic products. Thus, hypothesis 7 was rejected.

Table 5: Hierarchical Regression Models for Moderator Types of Consumer

Model	R	R ²	Adjusted R ²	R ² Change	F Change	Sig. F Change
1	.585 ^a	.342	.331	.342	33.137	.000
2	.608 ^b	.370	.359	.028	17.247	.000
3	.613 ^c	.376	.354	.006	.559	.763

Dependent Variable: Intention to Purchase

a. Predictors: (constant), Relative Advantage, Compatibility, Subjective Norm, Perceived Knowledge, Self-Efficacy, Trust

b. Predictors: (constant), Relative Advantage, Compatibility, Subjective Norm, Perceived Knowledge, Self-Efficacy, Trust, dummyMOD

c. Predictors: (constant), Relative Advantage, Compatibility, Subjective Norm, Perceived Knowledge, Self-Efficacy, Trust, dummyMOD, RAxMOD, COMxMOD, SNxMOD, PKxMOD, SELFxMOD, TRUxMOD

*P value is significant at <.05

V. Discussion

5.1 Determinants of the relationship between independent variables and dependent variables

5.1.1 Relative Advantage

In this study, relative advantage was measured by using incremental value of the product in a way to understand the consumers' perception about the product. The results showed that relative advantage has a positive and significant effect on intention to purchase Aquaponic products. In this study, relative advantage represents the attributes and performance exists in Aquaponic products. According to [Rogers \(2003\)](#), these attribute-based advantages provide significant improvements over previous innovations making it unique and superior at meeting a specific need. Thus, this study has consistent with the studies conducted by [Chou, Chen, and Wang \(2012\)](#) where the researcher has confirmed that relative advantage has positive impact on intention to adopt green practice. In their studies, relative advantage is relatively positive with the consumer attitude where high relative advantage on the innovation characteristic of the product consequently impacts consumer intention to adopt the product. Additionally, relative advantage on innovation characteristic has been studied by [Flight et al. \(2011\)](#) to examine the intention of consumer adopting green products. On the other hand, relative advantage of the product can be extended to other factors such as the environmental impacts of the product ([Lea and Worsley, 2008](#)). Aquaponic products are expected to be environmental friendly to protect and preserve a better environment. On behalf of the relative advantage, some researchers also defined relative advantage as the consequences after using the products to the consumer. Study conducted by [Lockie et al., \(2004\)](#) found that consumer behaviors are associated with the naturalness of food. From the results, the researchers found that the consumers are willing to purchase food from green products due to the naturalness of the food. The naturalness is the process of food made such as using organic fertilizer or chemical fertilizer. The process of producing food has influenced on the naturalness of food.

5.1.2 Compatibility

The Aquaponic products such as vegetable are different from the conventional products where consumer compares the product since they have experience consuming vegetables. The result showed that the consumers in urban and rural area have accepted this Aquaponic products because they believed that this Aquaponic products compatible in their life style even though the technique and process of production is different with the conventional product. Similarly, the study conducted by [Flight et al. \(2011\)](#) found that consumers are able to accept the new product when the product fits the existing lifestyle and social structure. In line with this, [Chou et al., \(2012\)](#) in their study has mentioned that compatibility is positively significant with consumer attitude and it is finally have significant relationship with consumer intention to purchase. Consumers have intentions to purchase green products in green restaurant where consumer feel the product is fit to their lifestyle such as eating healthy food and avoid food with high chemical fertilizer used. In line with this, [Jeon et al. \(2006\)](#) has conducted the study earlier and reported that product with environmental friendly concept is compatible to the consumer's need and effects consumer intention to purchase. In this case, the green products was introduced into the market as an obligation to bring awareness to the customers on the responsibility of protecting the environment. The researchers found that consumer have high intentions to purchase the product because it suits their lifestyle.

5.1.3 Subjective Norm

With respect to the consumer motivation factor, subjective norm was assumed to have a positive impact consumer intention of Aquaponic products. Apparently, the result revealed that this subjective norm was found to have a significant and positive impact on intention to purchase Aquaponic products. Previously, another study was reported to use subjective norm to examine the consumer intention to use the products such as eating fruit ([Pawlak and Malinauskas, 2008](#)) and for intention governing purchase of food ([Dean et al., 2008](#)). Subjective norm in the previous research is one of the important factors in TPB but the finding of the result found to be inconsistent. However, the study conducted by [Zagata \(2012\)](#) has found that subjective norm is significantly

having positive relationship with the consumer purchase intention of organic food product. The result showed that questionnaires prepared for subjective norm is to examine consumer purchase intention has strongly significant with Cronbach's alpha value of 0.84. In addition, Astrom and Rise (2001); Guardia et al., (2006) found that subjective norm is positively significant with consumer intention to purchase healthy product.. However, there are studies reported that subjective norm is the weakest component in TPB components proportionate with the attitude, and perceived behavioral control. According to Thompson et al., (1994) in the context of food choice has found that subjective norm is a less significant with the consumer behavior of their intention to accept the food products. The study showed the consumer is basically aware of the food product in the market and they do not rely on other reference group/person to motivate themselves as their references subject to accept the product. Apparently, this study found subjective norm have positive significant with intention to purchase Aquaponic products, but the mean score was 3.40 which indicated the consumer are moderated opinion about their reference group/person to motivate themselves purchase this Aquaponic product. Hence, consumers are persuaded by high social pressure from others to perform the behavior than it is effectively positive with subjective norm towards their intention to purchase. In this study, consumer have positive subjective norm towards their intention to purchase Aquaponic product even this product is newly for them and their need some reference before their buy the product.

5.1.4 Perceived Knowledge

Perceived knowledge is important for consumer to accept new product, this study's result has revealed that perceived knowledge was significantly linked with intention to purchase Aquaponic products. Perceived knowledge in this study concerned about the important of knowledge or information about this Aquaponic products where the knowledge will lead the consumer search the best product for them and influence their intention to purchase. There are several possible reasons why the perceived knowledge is very important to be a factor of consumer intention to purchase green products. Study conducted by Pieniak et al., (2010) has explained that the knowledge into two specific different types of knowledge which is subjective knowledge and objective knowledge among 529 consumers in Belgium. The purpose of the study is to understand consumer intention to purchase and eat fresh water from local aquaculture industry. As a result, consumer with high knowledge about the product will have high intention to purchase and eat the fish. In addition, the researcher has suggested that the company should come out with campaign or advertisement with complete information about the product to enhance consumer knowledge. In line with the perceived knowledge, the consumers also improve their awareness and influence their intention to purchase the product. Another study by Gracia and Magistris (2008) found that the perceived knowledge of consumer about organic product among Italian consumers are positively significant to influence their both intentions, which is intention to purchase the product of organic and being a regular consumer of the product.

In line with this, another study was done in five countries in Europe such as United Kingdom, Germany, Spain, Norway, and France about the consumer perception of green products (organic). The researchers aim to understand the level of perceived knowledge of the consumers to perform their behavior or intention to purchase the product (Aarset et al., 2004). The result showed that the relationship of perceived knowledge to consumer intention was weak rather than other variables. For instance, the researchers found that consumers are confused on the organic terms in the product. Also, consumer is not aware about the importance of organic certificate provided to the company. Thus, the lack of knowledge among consumer about the products has effect on consumer intention to purchase the product. In sum, high level of consumer knowledge will affect the strangeness of consumer's intention to purchase green products. Additionally, majority of researchers mentioned the lack of knowledge among users in Europe in terms of organic food (Aarset et al., 2006; Peattie, 1990; Kristensen and Grunert, 1992). Midmore et al., (2005) figured out that the knowledge of Europe organic goods generally is in low rate, meanwhile significant differences existed through European countries.

5.1.5 Self-Efficacy

For self-efficacy, this study found that self-efficacy did not significantly impacted on intention to purchase Aquaponic products. The result of this current study showed that the confusion among consumer in making decision of the purchasing behavior. This is driven by few factors that influence consumer product selection of new product such as Aquaponic products. The consumer may not be familiar with the product and where they can buy the product if their willing to buy this product. Also, the consumer may think that the price offered for this Aquaponic products not affordable for them. Hence, self-efficacy is not significant with consumer intention to purchase Aquaponic products. However, study conducted by Milne and Orbell (2000) found that self-efficacy is significant with consumer intention for certain health promoting behavior. The researchers found that consumers have high intention to perform healthy lifestyle to choose daily products such as food products.

Similarly, Luszczynska (2004); Scholz, Sniehotta, Schüz, and Oeberst (2005); Schwarzer (2008); Umeh (2003) have found that self-efficacy is positively affected by consumer intention to adopt healthy behavior and influence their intention to purchase healthy products. In addition, it is shown that self-efficacy is due to consumer ability in their subjective judgements to perform or persist in a particular behavior. According to Keller (2006); and Liu (2008), consumer believed that they can undertake healthy behavior and self-efficacy of consumer was high according to the high expectation outcome from the health product that they consume for their body. Ajzen (1985; 1991) has conceptualized those who have lower efficacy beliefs about performing certain behaviors will be less likely to form behavioral intentions. The study conducted by Cox et al., (2004) has examined the middle-aged consumers' intentions who consume different types of green foods that could increase the acceptance of the products in the market. The researcher demonstrated that self-efficacy is related to the impact of the consumer consumption of green products in preventing environmental issues.

5.1.6 Trust

As far as trust is concerned, the existing result revealed that trust was not significantly linked with intention to purchase Aquaponic products. This study considers trust as a belief, where the user accepts Aquaponic products and performs task according to their expectation (Ortega, 2011). However, trust is conceptualized as consumer belief on their confident level which derived by several factors such as various actors with responsibility for Aquaponic products (Berg et al. 2005; Brunel and Pichon 2004; Grunert, 2002). Interestingly, a study conducted by Meyer et al., (2012) about consumer trust of food production is ultimately effect consumer intention to purchase the product. The study is covered two types of consumers, rural and metropolitan (urban). The study was conducted to consumers' trust on food production and regulation. The results showed that rural consumer have higher levels of trust. Level of trust for rural consumer trust is significantly higher, even though they are not satisfied with government regulation as responsible body that controls the food industry. However, they were likely to be more optimistic about trust in the food supply because they directly have experience on food production. They believe that role of government is to over-regulate is common in food industry. Rural consumers are not overly dependent on the rules and regulations that govern food because they believe that a 'bit of dirt' in food is required for the durability of their children. In contradict, metropolitan or urban consumers indicated less trust because they are socially not involved in food production. However, the metropolitan consumers have higher level of trust in government role in food industries where they don't have capacity for food safety assurance. In addition, when the government imposes more regulations to increase food safety and quality indicated there is lack of trust in local food production. However, previous research conducted by Henderson et al. (2011) in Australia showed that adult consumers are more emphasized on food hygiene and food inspection from the government even though consumer trust over the food regulators are low.

5.2 Determinants of moderator factor

As a results of a hierarchical multiple regression analysis, this current study of types of consumers as moderating factors found to be insignificant, which is no moderation effect on the relationship between independent variables and intention to purchase Aquaponic. This has indicated that types of consumers is not strong enough factor to influence or effect the relationship between independent variables (relative advantage, compatibility, subjective norm, self-efficacy, perceived knowledge, and trust) and dependent variable (intention to purchase Aquaponic products) established in this study. However, this finding contradicted with previous studies concerning the importance of types of consumer to determine the factors on consumer's green products purchase intention. Few researchers have found that consumer intention to purchase varies with their demographic characteristic where it would be effected by the consumer intention to purchase the product. A study conducted by Kikulwe et al., (2011) reported urban consumer is more particular with green products quality where they can buy the product with high price from the market compared to rural consumer. Similarly, Loureiro and Bugbee (2005), Lusk et al., (2005), and Qaim (2009) found that consumer purchase intention was significantly moderated the factor of consumer purchase of the product. Researcher has found that consumer trust is positively significant with consumer purchase intention where rural consumers have more high level of trust on government who have responsible to protect the industry rather than urban consumer. Also, rural consumers were found to be more concerned towards environment in their purchasing behavior of green products.

On the other hand, consumers of green products are related to an 'ethical lifestyle' of the consumer (Schiffstein and Oude Ophuis, 1998) where these two types of consumers, urban and rural consumer had a distinguished value and moral belief according to their living environment (Michaelidou and Hassan L.M., 2010). According to Williams and Hammitt (2000) buyer of green products were more associated with

environmental friendly behaviors. In line with this, the study conducted by Honkanen et al., (2006) found that ethical and environmental issues of regional place were motivated to the consumers of green products. Previously, Chen (2009) and Brunso et al., (2004) has reported that the concept of ethical lifestyle is linked to consumer behavior. The consumers' ethical lifestyle is consisted of cognitive and conative elements in consumer behavior such as adopting a green products for their healthy lifestyle (Chen, 2009).

VI. Implication and Limitation

6.1 Implication of this study

The results of this research are very important and effect to the local aquaculture industry. Generally, research of consumer acceptance of the product is crucial to all new products before entering the new market. Basically, Research and Development (R&D) for new product development will be conducted to understand on consumer demographics and their acceptance. The industry and also the company are need to understand all the things before taking a decision on the commercialization of the product. Furthermore, this study has important to policy implication. Aquaponics products are produced to reduce the impact of environmental pollution such as river and sea water from aquaculture industry waste water where the management of waste is not technically efficient. Using Aquaponic, the waste water from the aquaculture industry can be used to plant vegetables without releasing the waste water to the environment. In this recent study, consumers have high awareness upon their responsibilities to conserve the environment. Indeed, the government's intention to create a consumer who has a high awareness of the importance of the environment can be continued when the government actively implementing environmental policies and foster values like this in the younger generation. In addition, the government which has the capacity to create the legislation and enforcement towards the environment is important to increase the environmental awareness of society and support local green product.

6.2 Limitation of this study

The study not only encountered constraints with resources; but, also the limited sampling frame to only several places in urban and rural area in Malaysia. Therefore, the result would be much better if the sampling area was widened to extended rural and urban areas. Thus, the study should be conducted in broader geographical location covering other parts of Malaysia; for instance, the North Peninsular Malaysia for further exposure on Aquaponic studies.

The limitations were also found on the variables of study affecting the consumer purchase intention. The present study had tested six different variables towards consumer intention to purchase Aquaponic products. The results indicated that four (relative advantage, compatibility, subjective norm, and perceived knowledge) of the variables showed positive significant relationship with the purchase intention; meanwhile, other two variables showed none significant relationship (self-efficacy and trust). Based on previous studies, there are many variables that drive the consumer motivations and influence their purchase intention such as the green advertising, eco-label and psychological factor as determinants of green purchasing intention.

VII. Conclusion

In summary, the study showed that consumers in Malaysia show a positive intention on purchasing these Aquaponic products. Positive results in this study can be an indicator of the great opportunity in the market to the producers of Aquaponics products. This is due to several reasons such as the consumer has high of intention to purchase Aquaponic products based on the mean score of dependent variables (intention to purchase Aquaponic product). In addition, they are also aware about the important of green product to the environment and health. Also, this study has found that consumer have influencing tendency inspired through cultural value to protect the environment through purchasing green product such as Aquaponic products. Lastly, this study provided an important insight about consumer acceptance of Aquaponic products. From the result obtained through this research, the government and producers (farmers) can identify the market condition and designing the strategy to enable successful of Aquaponic product.

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