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Modelling cognitive determinants of the intentions to consume foods from edible insects: An application of the theory of planned behaviour

Kennedy O. Pambo[*1], Robert M. Mbeche[1], Julius J. Okello[2] and John N. Kinyuru[3]

1 Department of Agricultural and Resource Economics, Jomo Kenyatta University of Agriculture and Technology. P.O. Box 62000-00200, Nairobi, Kenya.

2 International Potato Center, Uganda Liaison Office. P.O. Box 22274, Kampala, Uganda

3 Department of Food Science and Technology, Jomo Kenyatta University of Agriculture and Technology. P.O. Box 62000-00200, Nairobi, Kenya.

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[1] Corresponding author E-mail: kennedypambo@gmail.com

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Abstract

This paper explores the factors that determine the formation of the intentions of rural households in Kenya to consume foods from edible insects in order to curb undernutrition and conserve local diversity. The theoretical framework borrows from Ajzen's Theory of Planned Behaviour (TPB) modelled by a Structural Equations. The model is moderated by the dominance of selfish motives and altruistic motives as the basis of the influence on intentions to consume foods from edible insects. Survey questions were developed using focus group discussions followed by face-to-face interview of 432 randomly sampled households in western and eastern parts of Kenya. Key findings are that attitudes, and perceived behavioural control are significant in determining intentions, but not subjective norms. In addition, the differences in consumption-influencing factors are strongly moderated by the dominance of selfish or altruistic motives: Selfishly motivated consumers' intentions are influenced mainly by the attitudes, whereas for the other consumers, both the attitudes and perceived behavioural control are relevant. Changes in intentions given the nature of its determinants, moderated by either behavioural dominance (selfish or altruistic), as well as policy implications are discussed.

Key words: Foods from edible insects, altruistic vs selfish motivation, consumer intentions, theory of planned behaviour

1.0 Introduction

Achieving global food security whilst reconciling demands on the environment is the greatest challenge faced by mankind (Losey and Vaughan, 2006). By 2050 at least 9 billion people will need food, especially proteins, and increasing incomes and urbanization will inevitably lead to dietary change. The food security challenge will increasingly encompass the triple burden of malnutrition – under nutrition, obesity and micronutrient deficiencies (Belluco et al., 2013; Van Huis, 2013). The current food production levels must drastically increase to satisfy growing population. However, land and other natural resources that must play central role for food production to increase are becoming increasingly scarce, overused and less sustainable (Tan et al., 2015).

Of all foods that supply protein to the diet, meat bears the greatest impact on the environment (FAO, 2013; Hartmann et al., 2015; Hartmann and Siegrist, 2016). A meat-based diet requires a significantly greater amount of environmental resources per calorie compared to a more grain-based diet. For example, to produce 1kilogram of meat, 2-15 kilograms of plant protein is inefficiently converted (Chakravorty et al., 2013). Indeed, food consumption generally has the largest total effect on the environment (estimated at 20-30%), of all the activities consumers are undertaking in and around their homes, such as transport and energy use. Therefore, what we eat, how we live, our own health, and the health of our environment, has gained significant attention in recent debate and policy discourse (Hoek, 2010). A feeling that something needs to change is gaining momentum.

Edible insects has recently received increased attention as a potential remedy to the undernutrition challenge, particularly as a potential alternative to meat (Verbeke, 2015). Insects are a rich source of protein that can improve human diet, especially for individuals suffering from poor nutrition due to protein deficit. Consumption of insects also conserve the environment because they are exceptionally efficient in converting what they eat into consumable tissue (Losey and Vaughan, 2006). Moreover, insects feed on a wide range of plants while rearing them requires far less space and generates less pollution compared to conventional livestock (FAO, 2013; van Huis and Vantomme, 2014). Additionally, the capturing, processing, transporting and marketing of foods from edible insects can provide income and livelihood opportunities to many households around the world (Lundy and Parrella, 2015; Tan et al., 2015).

Consumer acceptance remains the greatest barrier to edible insect' value-chains in Kenya, despite the promotion efforts by a number of organizations including the Food and Agriculture Organization of the United Nations (FAO, 2013; Van Huis and Vantomme, 2014). Understanding consumer intentions and motivation informs the right strategies for dietary campaigns to promote foods from edible insects. Moreover, consumers are expected to have different motivations regarding foods from edible insects. Following Newholm and Shaw (2007), individuals have increasingly assumed responsibility for their consumption behaviour provided that their basic needs can be satisfied. Indeed, this is particularly true for the food sector where consumer awareness for sustainability issues has increasingly gained momentum in recent years (Tan et al., 2015). The increased responsibility for what people eat is driven by among others, the concerns about the impact on society and on the environment (Oh and Yoon, 2014). Thus when consumers engage in insects' value-chains, the benefits they expect can be categorized as being either *selfish* or *altruistic* (Rebecca-Ariane and Jutta 2015).

Altruism implies voluntary acts performed with the intention to do others good in no anticipation of external compensation or an act of helpfulness rendered to others without intention to attain self-gain (interest) or social recognition (Oh and Yoon, 2014). The current study therefore, compares the intentions of rural-households based on selfish or altruistic motives using the theory of planned behavior (TPB). Specifically, the study identify factors that influence consumers' intention to consume foods from edible insects. Additionally, it determines whether a difference in consumption-influencing factors is due to the dominance of selfish or altruistic motives driving consumer' behavioural intention. The results provide evidence for differentiated and targeted information while designing campaigns aimed at promoting acceptance of foods from edible insects.

Some studies employing the subjective expected utility theories have argued in favour of the theory of reasoned action (TRA) rather than the theory of planned behaviour (TPB) when explaining the impact of altruism on consumer behaviour (for reviews see, Oh and Yoon, 2014). This is because two major component of TPB – the subjective norms (SN) and the perceived behavioural control (PBC) are rarely influential. For example, the construct of altruism was studied in connection with the purchases of fair trade coffee (Loureiro and Lotade, 2004) and environmental conscious consumption (Schwartz, 1977). In both cases, subjective norms and perceived behavioural control

were not significant. Interestingly, Oh and Yoon (2014) used the theory of reasoned action (TRA) to explain factors affecting ethical consumption and subjective norms was found to be insignificant, confirming that TRA is actually not superior to TPB when modelling altruism. The current study therefore, contribute to the research about applications of the TPB in the realm of altruism. This study is distinct to Oh and Yoon (2014), who postulated altruism as an antecedent of attitudes towards ethical behaviour in TRA, but follows Heath and Gifford (2002) and Rebecca-Ariane and Jutta (2015) who considered altruistic motivation as a moderator in the traditional constructs of the TPB.

1.1 Theoretical framework

The theory of planned behaviour (TPB; Ajzen, 1991) posits that behavioural decisions are not made spontaneously, but are the result of a reasoned process in which behaviour is influenced, albeit indirectly, by attitudes, norms, and perceptions of control over the behaviour (Smith et al., 2007). The TPB is an extension of an earlier theory of reasoned action (Fishbein and Ajzen, 1975), which proposed that an individual's participation in a behaviour (consumption of foods from edible insects in this case) could be predicted by his/her motivation to perform the behaviour (i.e., intentions). Intentions is predicted by an individual's evaluation of how favourable the behaviour is (i.e., attitudes) in addition to the individual's perceived social pressure to participate in the behaviour (subjective norm, SN). In forming the TPB, Ajzen (1991) added perceived behavioural control (PBC) to the theory of reasoned action. PBC is defined as an individual's perceived ease or difficulty of performing the behaviour and is proposed as a predictor of both intention and behaviour (Armitage and Conner, 2001).

The TPB model, in its original formulation, proposes that attitudes, subjective norms and perceived behavioural control, influence behaviour primarily through their impact on behavioural intention. Hence, intention is seen as the proximal determinant of behaviour (Sparks and Shepherd, 1992). Altogether, the TPB implies that intention and perceived behavioural control predict behaviour; attitude, subjective norms, and perceived behavioural control predict intentions; and salient beliefs predict attitudes, subjective norms, and perceived behavioural control. Ajzen (1991) explained that salient beliefs are the determinants of an individual's behaviour and actions. Salient beliefs can be categorized as behavioural beliefs, normative beliefs, or control beliefs. Behavioural beliefs are predictors of Attitudes, normative beliefs of Subjective Norms, and control beliefs of Perceived

Behavioural Control. In order for beliefs to be predictive, they must be salient. Salience varies between individuals and also can vary based on situations that are present in an individual's life. The current study intends to investigate whether saliency could also vary depending on the dominance of 'altruistic' or 'selfish' behaviour.

2.0 Method

2.1 Focus groups

Six focus groups were conducted to develop survey questions, using the procedure suggested by Krueger and Casey (2000). The focus groups were conducted using a general plan of inquiry, with discussion facilitated around reasons for participants' intentions and attitudes. The plan sought to avoid prefiguring responses. Overall, 15 male and 28 female participants, aged between 27 – 56 years, participated in the groups making a total of 43 households. A semi-structured script containing open-ended questions was used to guide group discussions and probes were used to encourage elaboration of responses. Questions focused on each construct of the TPB. Examples of questions include: 1) attitudes: "*tell me about the good/bad things associated with FEI*", 2) subjective norms: "*who are the individuals or groups who would approve or think you should consume FEI, and who would disapprove*?; *Whose feelings would you take into account when deciding to consume FEI*?" and 3), PBC: "*Which factors or circumstances would make it easy/difficult or enable/prevent you consume FEI*?" The development of survey questions was facilitated by having participants agree on the important reasons for their intentions, which was supplemented by an assessment of the frequency of items being raised in the groups.

2.2 Questionnaire

Behaviour was defined for all participants as consumption of foods from edible insects regularly for the next 12 months. Scones baked from wheat flour mixed with 10% cricket powder (cricket-flour scones) was provided to the participants as an example of foods from edible insect. Participants were asked to use the given definition and consider the provided exhibit (cricket-flour scones) when answering all TPB related questions. The questions were presented in a fixed random order and those that concerns of this paper are described in the following paragraphs (all questions were measured on 5-point scales and only the endpoints were anchored; endpoints are indicated in

parentheses; reverse coding of variables was carried out where appropriate). The questions were developed by the methods proposed by Fishbein and Ajzen (1975), and adopted by Francis et al. (2004); Verbeke (2005); and Dean et al. (2008).

Attitude. Attitudes was measured with four *behavioural belief* statements that began with *"Assuming foods from edible insects are available in your locality and you've decided to consume them: Consuming these foods regularly would mean eating…"* and anchored by the following: (i) foods that are safe; (ii) foods that taste good; (iii) healthy foods; and (iv) diversified diets. The items were rated on a scale ranging from 1(*totally disagree*) to 5 (*totally agree*). Cronbach's alpha test revealed that the four items were consistent in measuring attitudes ($\alpha = 0.70$).

Subjective norms (SN). SN was also measured with four *normative belief* statements below *(i) "my family members would encourage me to consume foods from edible insects regularly"; (ii) "my religious leaders would approve of my consuming foods from edible insects regularly"; (iii) "my peers/workmates would approve of my consuming foods from edible insects regularly"; and (iv) "my neighbours would approve of my consuming foods from edible insects regularly"*. The items were rated on a scale ranging from 1(*strongly disagree*) to 5 (*strongly agree*). Internal consistency (reliability) of the four items was acceptable ($\alpha = 0.75$).

Perceived behavioural control (PBC). PBC was measured by four *control belief* statements below *(i) "I find it easy to assess the quality/safety of foods from edible insects"; (ii) "foods from edible insects are readily available for me"; (iii) "my eating of foods from edible insects depends only on my decision and not on external conditions"*. The three items were rated on a scale ranging from 1(*totally disagree*) to 5 (*totally agree*). (iv) "*How much control do you think you have over whether you can consume or avoid consuming foods from edible insects?"* The fourth item was rated on a scale ranging from 1(*no control at all*) to 5 (*complete control*). Principal component analysis on the four items yielded two classes that explained 84.5% of the variance and an acceptable consistency ($\alpha = 0.68$). The first class contained questions iii & iv that asked whether participants believed eating foods from edible insects was within their volitional control and was therefore, named "*perceived control*" while the second class included questions i & ii above, which asked the perceived 'ease of assessing quality of foods from edible insects' and the perceived 'availability' and was named, "*facilitating conditions*".

Selfish vs Altruism. The selfish and altruistic motives were assessed as elements of the behavioural beliefs (Fishbein and Ajzen, 1975). The motives were considered a possible consequence of consuming foods from edible insects. Salient behavioural beliefs were derived from the focus group discussions (section 2.1). The desirability measurement, based on four of these consequences rated on a five-point scale (1 "*totally undesirable*" to 5 "*totally desirable*"), were used for generating the groups. The four items are described below:

- *"I can benefit myself from edible insects' value-chains."*
- *"Consumption of edible insects will result in big profits for multinational companies."*
- *"My consumption of foods from edible insects will support development of insect-based industry in Kenya and many actors will benefit along the value-chain."*
- *"I often purchase food items based on my belief that their production conserves the environment."*

The first item was taken as the measure selfish behavioural motive, whereas the other three items measured altruistic motives. Following Rebecca-Ariane and Jutta (2015), the groups were categorized by computing the average assessment of desirability of the consequences of the last three motives and comparing it to the consequences of the first motive. Individuals who stated higher desirability for the first item were assigned to the group of *selfishly motivated consumers*. Individuals who rated personal benefits and benefits for others as equally desirable were assigned to the *neutral group*. Individuals who state higher desirability for the last three items on average were assigned to the *altruistically motivated group*.

2.3 Sampling and data collection

Two consumer regions (1 region where consumption of edible insects is very popular versus 1 region where the practice is rare) was purposively selected for the study to enable wider generalization of the results. Two counties[2], one from each region, were purposively selected and from each county, two locations were randomly sampled. From each location one sub-location was selected the same way, and then three villages were randomly selected from each sub-location. From each village, a list of all households was generated with the help of local leaders out of which eighteen were randomly sampled for the interview. This criteria yielded a total of 432 households.

[2] A county is the largest administrative unit in Kenya and is headed by a governor.

From each household, either the head of the household or the spouse was selected. If neither of the two was available, another person in the household who also participate in decisions regarding food purchase was requested to answer the questionnaire.

2.4 Data analysis

Covariance-based structural equation modeling (SEM) was used for data analysis. This method allows for concurrent testing of all causal hypotheses of the model and provides an overall measure of the model fit. Its application to latent variables, which cannot be observed directly but must be measured by manifest indicator variables, is based on the work of Jöreskog (1973). Model parameters are estimated by approximating the implied covariance matrix as closely as possible to the sample covariance matrix (Bollen, 1989; Hu and Bentler, 1999). Initially, this approach was applied for the full sample of 432 consumers to analyze how the intentions to consume FFEI is formed and to test the efficacy of TPB in our context. For the investigation of our second research question, if and how this process differs between the selfish and altruistically motivated consumers, a multiple-group comparison is conducted, again using SEM (Arbuckle, 2013).

2.5 Assessment of model fit

The χ^2 goodness-of-fit test determines whether the theoretical model fully fits the data, and it is the most useful statistic for testing nested and alternative models (Byrne, 2010; Rebecca-Ariane and Jutta, 2015). It assesses the adequacy of the theorized model's creation of a covariance matrix and estimated coefficients in comparison to the observed covariance matrix. Models that result in a created covariance matrix that significantly deviates from the observed covariance matrix are judged to be inadequate (Rhodes et al., 2004). For comparison of nested and alternative models, the χ^2 difference value versus degrees of freedom provides a statistical test for which model fits the observed data better. The goodness-of-fit index (GFI) is used in maximum likelihood (ML) estimations to measure the overall model fit (Jöreskog, 1973). However, inclusion of absolute and incremental fit indices are also recommended (Hu and Bentler, 1999; Byrne, 2010). Incremental fit indices measure the proportionate improvement in fit by comparing a target model with a more restricted baseline model, while absolute fit indices assess how well a priori model reproduces the sample data (Rhodes et al., 2004). For the current study, comparative fit index (CFI) was included as an index of incremental fit, and root mean square error of approximation (RMSEA) was included as an absolute fit index. General rules of thumb for acceptability of model fit using these indices

are: < 0.10 for RMSEA; > 0.90 for the GFI and CFI; and < 5 for χ^2/df (Bollen, 1989; Hu and Bentler, 1999; Byrne, 2010; Arbuckle, 2013).

3.0 Results

Table 1 present descriptive statistics detailing sociodemographic variables. The average age for the household was considered more representative than participant's age, which is biased in most cases. Results showed that the selfish group had larger household size and higher household age compared to both neutral and altruistic groups. The selfish group also had lower levels of education as most participants (about 65%) only had primary education and below (non-schooling and incomplete primary education). This group was dominated by female participants and had an almost equal income distribution among the three income-categories (low; medium & high). The altruistic group achieved gender parity (50%) and had the highest levels of education with approximately 55% acquiring secondary education and above. Altruistically motivated participants also had the highest income levels with 45% falling in the 'high' income category.

Table 1: Descriptive statistics by behavioural dominance

	Neutrals	Selfish	Altruistic
Variable			
Descriptive (Mean & Standard deviation)			
Age of household members (years)	26.7(10.5)	30.7(13.8)	28.1(11.7)
Size of the household	4.6 (1.9)	5.1 (2.3)	4.9 (1.9)
Frequency (Percentages)			
Income category (Kshs)			
Low income (< 70,400)	24.6	34.8	37.8
Medium income (from 70,400 - 260,000)	29.7	30.4	36.1
High income (above 260,000)	26.7	34.8	45.1
Gender (Female)	58.7	60.9	50.1
Highest education level attained			
Non-school & incomplete primary	19.6	10.1	14.4
Primary school	34.1	55.1	30.7
Secondary school	27.5	21.7	36.1
Some College (no University)	10.8	8.7	12.8
University	8.1	2.9	6.1
Sample size (n)	138	93	201

Note: 1 USD = Kshs.102 at the time of the study

The participants of the first group (neutrals) expressed in almost equal magnitude both selfish motivated behaviour and altruistic motivated behaviour; this finding applied to 138 participants. The second group expressed more selfish motives than to altruistic motives; this finding applied to only 93 respondents. For the third group, altruistic motives predominated over selfish motives: surprisingly, the group had the largest number of participants with 201 of the 432 survey participants belonged to this altruistically motivated group.

3.1 Factors influencing intentions to consume foods from edible insects

Structural equation modelling (SEM) was conducted using the computer program AMOS Graphics 22 (Arbuckle, 2013). A Shapiro-Wilk's test (Shapiro and Wilk, 1965; Razali and Wah, 2011) and a visual inspection of the Histograms, normal Q-Q plots and Box-plots showed that the intentions to consume FFEI' estimates were approximately normally distributed, i.e., Skewness of 0.453 (SE=0.411) and a Kurtosis of 0.512 (SE=629). Therefore, the Maximum Likelihood Method as the standard algorithm was applied for parameter estimation; this method has been found to be quite robust even under minor violations of normality (Byrne, 2010). Both the χ^2, GFI, IFI, and RMSEA showed acceptable fit for the model, as shown in Table 2.

Table 2. Goodness-of-fit-measures for the whole-sample model

χ^2 *(df)*	ρ	GFI	CFI	RMSEA
207.85 / 55	< 0.001	0.953	0.949	0.079

Figure 1 show the path coefficients for the whole sample. The strongest influencing variable on the intention was the attitude, with a path coefficient of 0.30. The interpretation is that when attitudes increase by 1 unit, intention to consume foods from edible insects also increase by 0.3 units. The perceived behavioural control (PBC) followed with a path coefficient of 0.20, and both paths (for attitudes and PBC) were significant ($\rho < 0.001$). However the path connecting subjective norms was negative against the expectations, but was not significant. The paths explained 23% of the variance of the intentions to consume foods from edible insects.

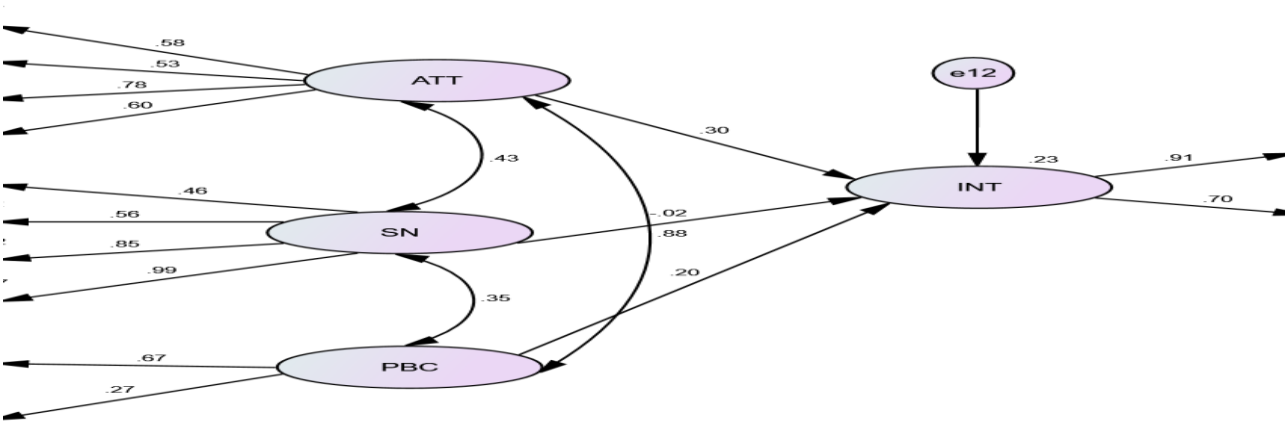

Figure 1. Path diagram for the whole sample

The path diagram for the neutrals group (Figure 2) closely resembled the path diagram for the whole sample with attitudes the most influential path (0.27), followed by PBC (0.16). Subjective norms was negative and all paths were significant ($\rho < 0.001$). 19% of the variance of intentions was explained.

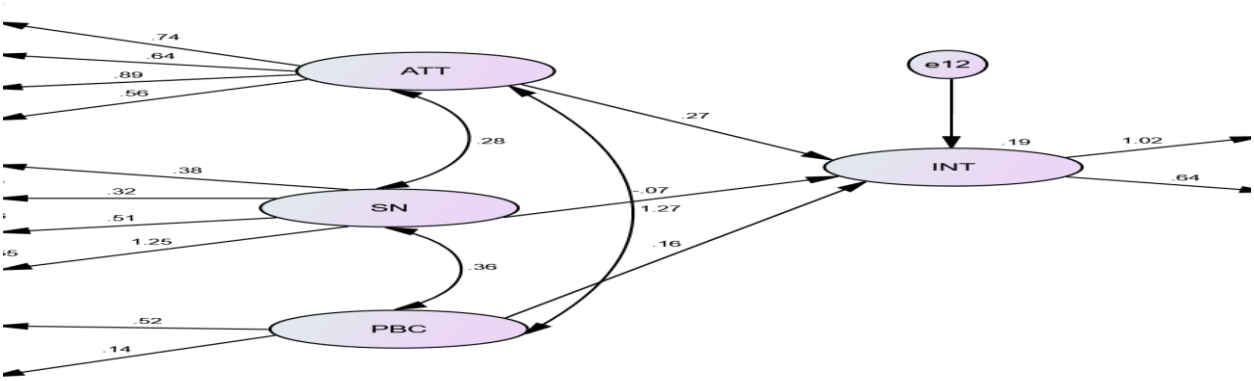

Figure 2. Path diagram for the neutral group

For the selfishly motivated participants (Figure 3), the influence of attitudes on intentions was 0.34, while the paths for PBC and subjective norms were 0.08 and 0.02, respectively. Contrary to other groups, the path coefficient of subjective norms for this group is positive.

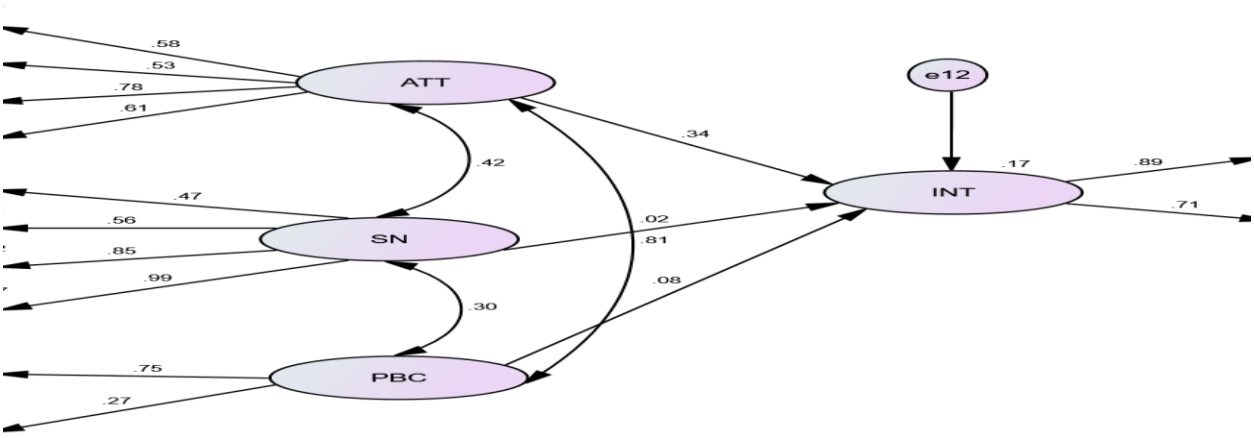

Figure 3. Path diagram for selfishly motivated group

For the altruistically motivated participants (Figure 4), the influence of the path coefficient for the PBC increased to 0.20 although the path coefficient of attitudes still had the largest influence on the intentions (0.29). The path coefficient for subjective norms was negative and all paths were significant ($\rho < 0.001$). The explained variance on the intentions to consume foods from edible insects was 20%.

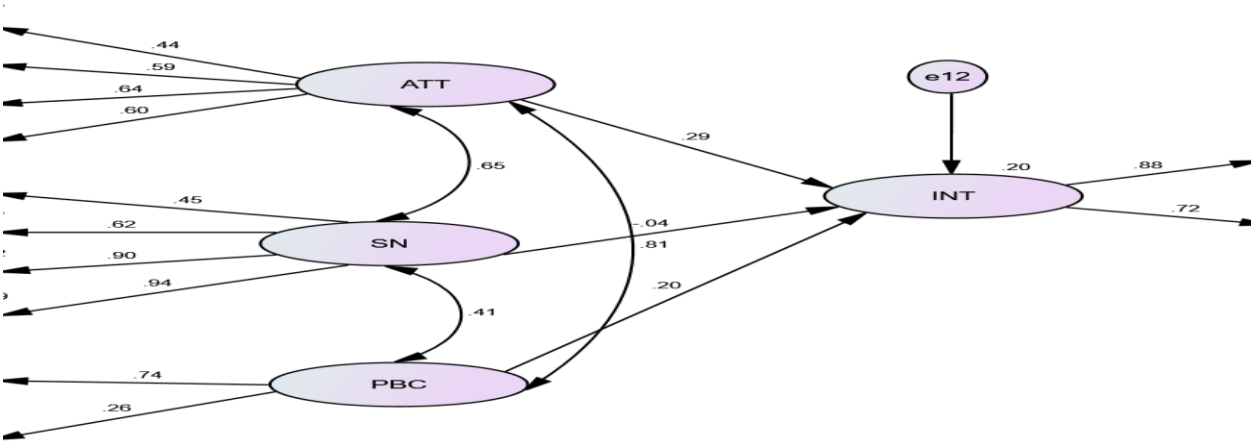

Figure 4. Path diagram for the altruistically motivated

4.0 Discussions and conclusions

The study applied the TPB to identify factors that influence rural-households' intentions to consume foods from edible insects. It then determined whether the difference in consumption-influencing factors was due to the dominance of selfish or altruistic motives driving consumer behavioural intention. The attitudes emerged the strongest predictor for intention followed by PBC with subjective norms the least influential predictor. Following the reviews of Armitage and Conner (2001), these are satisfactory results that compares favourably with other studies. For example, Cook et al. (2002) employed TPB that explained 24% of the variations in intention to purchase organic vegetables, while Thøgersen (2009), accounted for 18% variance in intentions to purchase organic tomatoes and tomato sauce. As Oh and Yoon (2014) noted, the finding that the subjective norm was not influential on consumption intentions imply that the participants had low level of normative beliefs about foods from edible insects and social referents, making it difficult for them to establish clearly defined referents.

The discrimination in consumption-influencing factors was strongly moderated by the dominance of selfish or altruistic motives: Selfishly motivated consumers' intentions were influenced mainly by the attitudes, whereas for the other consumers, both the attitudes and PBC were relevant. These results corroborates Schwartz's findings that social norms hardly explains altruism (Schwartz, 1977), but contradicts Rebecca-Ariane and Jutta (2015) findings that subjective norms to be the main influencing factor on the intentions for the altruistically motivated consumers. As expected, PBC had the largest influence on altruistically motivated consumers' intentions compared to other groups. However, the effect of the subjective norms was insignificant for this group against our expectations. It was expected that altruistically motivated consumers would comply with the people around them (social referents). This is because people who want the society and the environment to benefit in general and who also want to do good things for others might pay much attention to the expectations placed on them. But the results suggest that people who want to do good for others may not necessarily consider their opinion.

On a more practical approach, edible insects and products are being promoted as food sources that could possibly conserve the environment. As such, edible insects' value-chains involves considerations of critical elements for sustainable consumption, such as health, environment and others' welfare. Marketers of foods from edible insects, need to publicize and educate consumers

about the societal benefits to be gained from participating in edible insects value-chains. Empowered with such public awareness, marketers can enhance their social reputation and public social responsibility (image), which may lead to increased niche in the market. Campaigns aimed at promoting insects' value-chains may also benefit from segmented information based on lifestyle variables to identify target consumer groups, which are more receptive.

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