*Pak. J. Bot.*, 43(1): 705-714, 2011.

# FARM FORESTRY IN PAKISTAN: AN APPLICATION OF THEORY OF PLANNED BEHAVIOUR BY PROBING INTO THE MEASUREMENT ISSUES

**MUHAMMAD ZUBAIR[1*], CHRIS GARFORTH[2], SYED BILAL HUSSAIN[1], DIN MUHAMMAD ZAHID[1], MOHAMMAD SAFDAR BALOCH[3], FAZALUR RAHMAN SHAH[4], INAYAT ULLAH AWAN[5], MUHAMMAD AMAN ULLAH[6] AND NAZIM HUSSAIN[1]**

[1]*University College of Agriculture, Bahauddin Zakariya University, Multan, Pakistan*
[2]*Department of International and Rural Development (IRD), The University of Reading, Earley Gate, Whiteknights Road, RG6 6AL, UK.*
[3]*Agricultural Research Institute, 29020, Dera Ismail Khan, KPK, Pakistan.*
[4]*District Forest Officer, Punjab Forest Department, Bahawalpur, Pakistan*
[5]*Department of Agronomy, Faculty of Agriculture, Gomal University, DIKhan, KPK, Pakistan*
[6]*Department of Statistics, Bahauddin Zakariya University, Multan, Pakistan.*

**Abstract**

A research has been conducted over methodological issues concerning the Theory of Planned Behaviour (TPB) by determining an appropriate measurement (direct and indirect) of constructs and selection of a plausible scaling techniques (unipolar and bipolar) of constructs: attitude, subjective norm, perceived behavioural control and intention that are important in explaining farm level tree planting in Pakistan. Unipolar scoring of beliefs showed higher correlation among the constructs of TPB than bipolar scaling technique. Both direct and indirect methods yielded significant results in explaining intention to perform farm forestry except the belief based measure of perceived behavioural control, which were analysed as statistically non-significant. A need to examine more carefully the scoring of perceived behavioural control (PBC) has been expressed.

## Introduction

The Theory of Planned Behaviour (Ajzen, 1988), since its development from its predecessor; the Theory of Reasoned Action (Ajzen & Fishbein, 1980) has been widely applied to various settings, ranging from social science phenomenon to behaviours concerning pure science. A number of conceptual and methodological issues were raised by various researchers and addressed their suitability to specific conditions.

Extensive use of the theory of Planned Behaviour (TPB) as a psychological model provides an explanation to attitude-behaviour linkage (Manstead & Parker, 1995). The theory states that performance of behaviour is determined by intention to perform that behaviour. Intention is, therefore, an immediate determinant of behaviour and can be predicted from attitude, subjective norm and perceived behavioural control (Fig. 1). The attitude is the main focus of TPB and is conceptually defined as the "person's general feeling of favourableness or unfavourableness towards an object". Subjective norm, also called as peer pressure, is a measure of perceived social pressure (Carr & Tait, 1988), and is a function of normative beliefs (Ajzen & Fishbein, 1980). It explains that performance of a behaviour is related to opinions (approval and disapproval) of referents (individual or groups) who are important to the subject deciding to perform (not to perform) a behaviour. The third component which is the difference between the two theories (TRA and TPB), Perceived Behavioural Control (PBC) is the degree to which an individual feels that performance of the behaviour is under ones volitional control. It therefore, refers to skills, abilities, opportunities on the part of individual that can facilitate or inhibit the performance of behaviour (Ajzen, 1988).

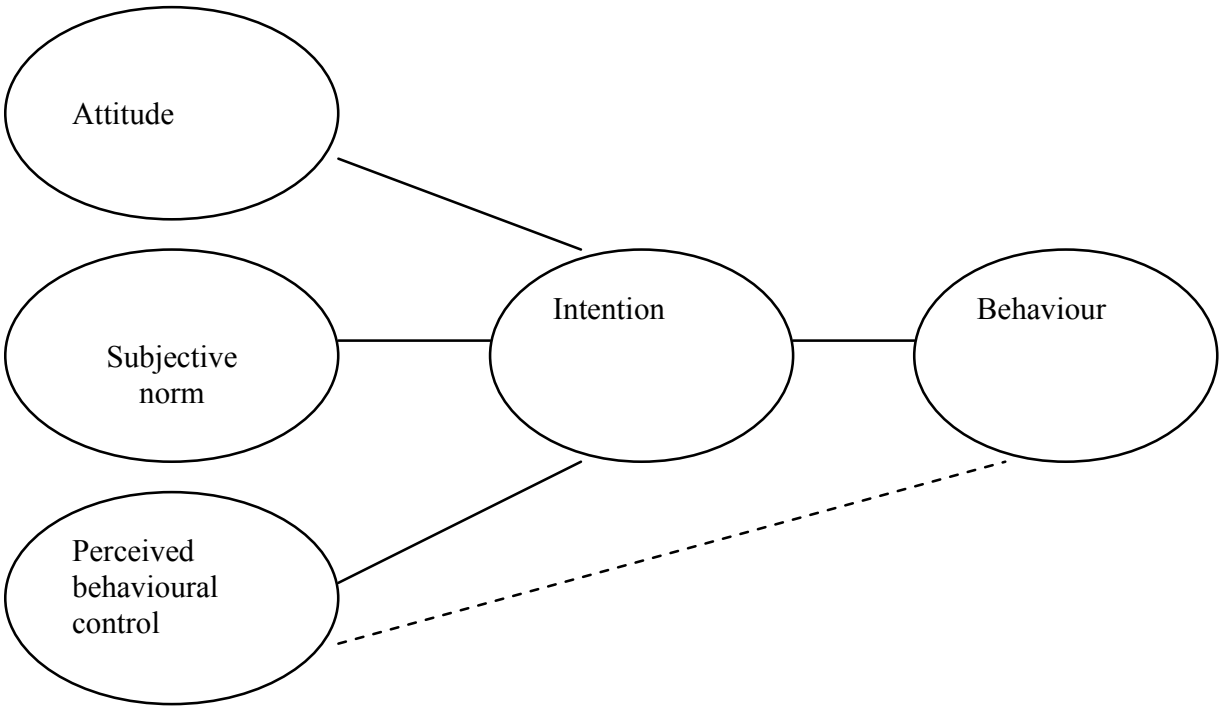


Fig. 1. Theory of Planned Behaviour (TPB).

A number of methodological concerns have been discussed by many researchers regarding the application of TPB to different behaviours. Of the most argued, are the two important issues of polarity of scales used to measure different constructs (unipolar and bipolar) of the TPB and the direction of measurement (direct and indirect measurement).

**Scaling the TPB variables, unipolar and bipolar scales:** The choice of an appropriate scaling technique is an important determinant to influence relationship among constructs in the TPB. The choice and use of scales, either unipolar or bipolar in measuring the constructs of TPB is a key methodological issue and is instrumental in affecting outcomes of a given construct. Although Ajzen (1991) described that both unipolar and bipolar scales can be used with equal justification and he also admitted that there is nothing in the theory to inform us that whether response to these scales should be scored in unipolar fashion or bipolar fashion. In a research by Bagozzi (1984) has shown the importance of selecting an appropriate scale. He also explained that sign of the measures in the bipolar scales affected the product of the components of various constructs of TPB and their correlation. Similarly Ryan & Bonfield (1975) worked out that evaluating the same statement using bipolar and unipolar scales produce different results. In their example, using "higher prices for supermarket products", bipolar scoring portray positive attitude towards universal pricing. Contrarily, a unipolar scoring of beliefs results in the reduction of an overall attitude towards universal pricing. Different researchers suggested variably the use of unipolar and bipolar scales in evaluating beliefs. Axelson & Brinberg (1989) mentioned that beliefs should be measured in a unipolar fashion (since probability ranges from 0 to 1), while the findings of Shephered (1988) indicated that higher correlation ($\sum$bi.ei, attitude) has been observed when the beliefs were scored in a bipolar way.

There is a clear hint that using either unipolar or bipolar scoring method may be a function of behaviour of interest and needs careful statistical consideration to select either of the technique. It is also evident that the polarity of scales is an important issue and their selection does alter the results. Keeping in view the earlier research, present study has been drawn a comparison by using both scales and see the usefulness of these scales regarding farm level tree planting in Pakistan.

**Measurement of constructs**

**Direct and Indirect measures:** An important issue concerning the methodological aspect of the TPB is the measurements of constructs (attitude, subjective norm and perceived behavioural control). Two measurement techniques are widely employed to measure the variables of TPB; direct and indirect techniques. There are favourable and unfavourable arguments in respect of using either direct or indirect measures. However, the selection of an appropriate method of measurement also depends upon the behaviour of interest, level of probe required and a time frame required to complete the research. Most of the researchers rely on the direct method to apply in measuring contracts of TPB, as it provides the results within a shorter time frame. Direct measures involves a relatively automatic response (Ajzen, 1991) regarding attitude, subjective norm and perceived behavioural control, while more careful deliberation and concentration (beliefs) involves when comprehending a behaviour. When the study involves more insight to behaviour and when emphasis is more towards analysing beliefs and evaluative outcomes, indirect measurement is more useful. Also indirect measurement involves a lengthy process of conducting a pilot work to identify salient beliefs (attitude), salient referents (subjective norm) and beliefs related to perceived ease or difficulty in performing behaviour (Perceived Behavioural Control). According to Ajzen (1991), indirect measures are very important in explaining behaviour, as behaviours often guided by beliefs. Based on the importance of the measurement of TPB constructs, and their function in affecting results, both direct and indirect measures have been used to understand the correlation and efficacy of the two measures in explaining farm level tree planting in Pakistan.

**Methodology:** In the present research, farm forestry behaviour was examined in order to individually focus on the constructs regarding polarity and direction of measurements. The components of TPB have been measured as follows:

**Attitude measurement (direct/indirect and unipolar/bipolar):** Attitude were measured directly by assessing the following two components:

**How I feel the Performance of farm forestry will be on my farm during the next year**

| Very unfavourable | Unfavourable | No opinion | favourable | Very favourable |
|---|---|---|---|---|
| 1(-2) | 2(-1) | 3(0) | 4(+1) | 5(+2) |

**For me to perform farm forestry on my farm during the next year will be**

| Very good | Good | No opinion | Bad | Very bad |
|---|---|---|---|---|
| 1(+2) | 2(+1) | 3(0) | 4(-1) | 5(-2) |

The indirect measure of attitude was derived from the summated products of *behavioural beliefs* (beliefs about the consequences of performing farm forestry) and *outcome evaluation* (evaluation of those consequences). A total of nine modally salient

beliefs (Table 1) were selected from the pilot study. For instance, "growing of trees on my farm during the next year will *increase my income*", and the response was measured on a five point Likert scale ranging from strongly agree to strongly disagree for measuring belief strength. Similarly the outcome evaluation was also measured against the nine modally salient beliefs by asking the respondents, for example, "how good or bad do you think that growing of trees on my farm during the next year will increase my income", and the response was evaluated on a five point Likert scale ranging from very good to very bad.

Unipolar measurements of the attitude were taken by scoring statement from 1 to 5 depending upon the scale used (agreement/ disagreement and good/bad), while bipolar measurements were assessed by scoring from +2 (strongly agree/ very good) to -2 (strongly disagree/ very bad) and "no opinion" response was scored as zero (0).

**Subjective norm measurement (direct/indirect and unipolar/bipolar):** A belief based measure (indirect) of subjective norm (SN) was assessed by the summated product of the *normative beliefs* (perceptions of the salient referents towards the performance of farm forestry on respondent's farm) and *motivation to comply* (degree to which the wishes of the salient referents are taken into account regarding farm level tree planting. Five salient referents were identified (family, tenant/ owner, fellow farmer, Forest Department, village old man) from the pilot study. Normative beliefs were assessed by asking farmers, for instance, "what is the possibility that my family would approve/ disapprove growing of trees on my farm during the next year", and the response was measured on a scale ranging from strongly agree to strongly disagree. Similarly motivation to comply was assessed, for instance, "how much do you follow the opinion of the following referents concerning the performance of farm forestry on your farm during the next year", and the response was measured on a scale ranging from very much to not at al.

SN were measured directly by a set of two questions:

**People who are important to me think that I should perform farm forestry on my farm during the next year**

| Strongly agree | Agree | Uncertain | Disagree | Strongly disagree |
|---|---|---|---|---|
| 5(+2) | 4(+1) | 3(0) | 2(-1) | 1(-1) |

**I am willing to do what the important others want me to do in relation to the performance of farm forestry on my farm during the next year**

| Very likely | Likely | Uncertain | Unlikely | Very unlikely |
|---|---|---|---|---|
| 5(+2) | 4(+1) | 3(0) | 2(-1) | 1(-2) |

A unipolar measurements of the SN (normative beliefs and motivation to comply) were obtained by scoring statement from 1 to 5 depending upon the scale used (agreement/ disagreement and very much/not at al), while bipolar measurements were scored as ranging from +2 (strongly agree/ very much) to -2 (strongly disagree/ not at al) and "no opinion" response was given a score of zero (0).

**Table 1. Attitude statements regarding farm level tree planting.**

| S. No. | Salient beliefs ("growing trees on my farm during the next year will") used to measure indirect measure of attitude |
|---|---|
| 1 | Increase income |
| 2 | Provide fuel wood and furniture wood |
| 3 | Control erosion |
| 4 | Provide shade for human beings and animals |
| 5 | Control pollution |
| 6 | Cause hindrance in agricultural operations |
| 7 | Incur more cost |
| 8 | Cause shade that reduce the yield of crops |
| 9 | Provide harbour to insects, pest and diseases |

**Table 2. Control factors regarding farm level tree planting.**

| S. No. | Perceived Behavioural Control (beliefs that the following factors will cause ease/difficulty in growing trees on your farm during the next year) used to measure indirect measure of PBC |
|---|---|
| 1 | Provision of barren land |
| 2 | Unavailability of market |
| 3 | Long term business |
| 4 | No awareness |
| 5 | Absentee landlord |
| 6 | Long-time land utilisation |
| 7 | Damage by humans/animals |
| 8 | Lack of nurseries |
| 9 | Acquisition of less income |

**Perceived Behavioural Control measurement (direct/indirect and unipolar/bipolar):** The third construct of TPB and a distinctive component between TRA and TPB was obtained indirectly by summing up the product of *control beliefs* (perception of the hindrances towards the performance of farm forestry) and *power of control beliefs* (perceived influence of each factor on the control towards the performance of farm forestry). A set of nine control beliefs (Table 2), as obtained from first phase of the field investigation, was modelled. A five point scale ranging from strongly agree (5) to strongly disagree (1) was used to compute the control items. Power of control beliefs was assessed on a scale ranging from very easy (5) to very difficult (1) and vice versa depending upon the nature of the statement.

PBC were also measured directly by asking the respondents as set of three questions:

**For me to adopt farm forestry on my farm during the next year will be**

| Very easy | Easy | Uncertain | Difficult | Very difficult |
|---|---|---|---|---|
| 5(+2) | 4(+1) | 3(0) | 2(-1) | 1(-2) |

**If I wanted to I could easily perform farm forestry on my farm during the next year**

| Very likely | Likely | Uncertain | Unlikely | Very unlikely |
|---|---|---|---|---|
| 5(+2) | 4(+1) | 3(0) | 2(-1) | 1(-2) |

**How much control would you say you have over whether you perform farm forestry on your farm during the next year?**

| Completely controllable | Controllable | Uncertain | Uncontrollable | Completely uncontrollable |
|---|---|---|---|---|
| 5(+2) | 4(+1) | 3(0) | 2(-1) | 1(-2) |

## Results and Discussion

**Direct and indirect measures of attitude, SN and PBC:** Present research has been utilizing TPB as a framework to allow us to concentrate on more relevant aspects of tree planting behaviour. These aspects include what people believe will be the consequences of farm level tree planting, influence of salient referents and the degree of control the respondents believe that they have over tree planting behaviour. The model offered the combination of its components which are known to influence behavioural intentions.

The mathematical expression of the model is:

**B$\alpha$ I = f {Att + SN + PBC}**

Where

B = Farm level tree planting behaviour
I = Intention to plant trees on farmlands
Att = Attitude towards planting trees on farmlands
SN = Subjective norm towards planting trees on farmlands
PBC = Beliefs concerning control over planting trees on farmlands

To understand the association between the components of TPB and to assess which component is more effective in predicting the intention to farm level tree planting, correlation and regression analysis were used. Both direct measures and belief- based measures of TPB components were used, and a separate analysis was performed for each measure. Spearman rank order correlation was used to relate elements of TPB model. The results of the correlation between direct and belief based components are presented in Tables 3 and 4. A high level of association was observed which is significant at 1% level between intention to plant trees and the direct measures of attitude, subjective norm and perceived behavioural control (Table 3). Regarding belief based measures, attitude and subjective norm were significantly related to next year intention, whereas relationship between perceived behavioural control and intention appeared non-significant (Table 4).

In order to make predictions about the relative contribution of three components of TPB to next year intention, a regression analysis were performed. Results of the regression of intention to plant trees on the other variables of TPB (attitude, subjective norm and perceived control) are displayed in Tables 5 and 6. A separate regression analysis was performed for each of the direct and belief based measures of TPB. Regarding direct measures, each of the variables was significantly associated with intention with subjective norm (F-value=148.11, $p<.001$) having the greatest influence followed by attitude (F-value=90.91, $p<.001$) and perceived behavioural control (F-value=50.96, $p<.001$) (Table 5). For two components, the same results were observed when the belief-based measures of TPB were regressed onto intention: this showed that intention to plant trees on farmlands was significantly influenced by subjective norm (F-value=107.74, $p<.001$), followed by attitude (F-value=51.234, $p<.001$). The exception was perceived behavioural control, which is found non-significant (Table 6).

**Table 3. Spearman's correlation coefficients between direct measures of TPB components.**

| Components of TPB | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| 1. Intention | - | - | - | - |
| 2. Attitude | *** | - | - | - |
| 3. Subjective norm | *** | *** | - | - |
| 4. Perceived behavioural control | *** | *** | *** | - |

*** Showing significance at .001 levels by using spearman's correlation coefficients.

**Table 4. Spearman's correlation coefficients between belief-based measures of TPB components.**

| Components of TPB | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| 1. Intention | - | - | - | - |
| 2. Attitude | *** | - | - | - |
| 3. Subjective norm | *** | *** | - | - |
| 4. Perceived behavioural control | Ns | * | ns | - |

*, *** Showing significance at .05 and .001 levels, and, ns, showing non-significance by using spearman's correlation coefficients.

**Table 5. Regression of intention onto direct measured components of TPB.**

| Independent variables | $R^2$ | β | F-value | Sig |
|---|---|---|---|---|
| Attitude | 0.427 | 0.653 | 90.91 | *** |
| Subjective norm | 0.548 | 0.740 | 148.11 | *** |
| Perceived behavioural control | 0.295 | 0.543 | 50.96 | *** |

*** showing significance at .001 levels by using spearman's correlation coefficients.

**Table 6. Regression of intention onto belief based measured components of TPB.**

| Independent variables | $R^2$ | β | F-value | Sig |
|---|---|---|---|---|
| Attitude | 0.296 | 0.544 | 51.234 | *** |
| Subjective norm | 0.469 | 0.685 | 107.74 | *** |
| Perceived behavioural control | 0.001 | 0.029 | 0.103 | ns |

*** showing significance at .001 levels, and ns, showing non-significance by using spearman's correlation coefficients.

The belief based measure of perceived behavioural control was observed as poorly related to next year intention to plant trees on farmlands, however, the direct measure of the same component was found significant based on correlation and regression analysis. Similarly reliability analysis also indicated low Cronbach's alpha coefficients (Table 7) for belief based measure of perceived behavioural control. Present research has used the procedure and format developed by Ajzen (1988) for the measurement of perceived behavioural control (belief based). The best ways to identify and measure PBC is still in question. As various researchers measured PBC differently, depending upon the behaviour of interest, it was hard to compare across different studies (Godin & Kok, 1990). Moreover, there is hardly any procedure for standardising measures of perceived behavioural control as compared to attitude and subjective norm measures (Geekie, 2000). According to Bandura (1986) and Sparks *et al*., 1992 [Stubenitskey & Mela, 2000], "to ensure a greater association between PBC and behaviour, the questions related to PBC should be asked differently as different sort of behaviours see the issue of control differently and there is need to evolve a separate measurement strategy for each behaviour under investigation regarding PBC."

**Unipolar and bipolar measurements of attitude, SN and PBC:** In order to draw comparisons between unipolar and bipolar scales used to measure the constructs of the TPB, reliability analysis was performed. The components of TPB: attitude, subjective norm and perceived control, were subjected to reliability analysis by using Cronbach's Alpha coefficients of internal reliability (Cronbach, 1951). The Cronbach's Alpha is a numerical coefficient of reliability and is used to describe the reliability factors extracted from a dichotomous and/ or multipoint formatted questionnaire (Santos, 1999) or scale (eg., rating scale: 1= strongly disagree, 5= strongly agree). The higher the scores, the more reliable the generated scale is. Reliability coefficients for direct measures of attitude (0.85), subjective norm (0.79) and perceived behavioural control (0.71) were above acceptable level of reliability coefficient of 0.60 (Table 7). Similarly reliability coefficients for the belief based measures of attitude and subjective norm (0.71 and 0.80) respectively were also above the acceptable level. There was, however, a low alpha value of 0.46 for the belief-based measure of perceived behavioural control (Tables 8). According to McKennell (1970) when Cronbach's alpha coefficient falls below 0.60, the reliability of the scale becomes suspect. However, low levels of alpha coefficients were also used in research, a value of alpha of 0.60 or higher has normally been used in research though.

Comparisons were also drawn by calculating correlation coefficients (Spearman's *rho*) among the constructs of TPB by using both unipolar and bipolar scales. The comparisons are presented in Table 8.

The main purpose of present research is to address methodological issues concerning TPB, a useful tool, to analyse farm forestry behaviour in Pakistan. The research shows that both direct and indirect methods yielded significant results in explaining association between different components of the TPB except the belief based measure of the PBC. The research encountered a problem with the belief based measure of perceived behavioural control showing weaker association to intention to plant trees and recognised the need in future research, to concentrate on the measurement of control beliefs by devising separate question formats regarding tree planting behaviour. Perceived behavioural control has made a successful contribution in providing base line information and framework in identifying factors salient to farmers that impede or increase the performance of farm forestry. However, perceived behavioural control as collective component does not appear to be significantly related to intention to perform farm forestry. The most important consideration is the measurement of perceived behavioural control. The reliability analysis indicated that items constituting the summated product of the control and power of control beliefs show low reliability coefficients that fall under the acceptable reliable limit and are, therefore, not highly related. This leads towards the emphasis of carefully considering the wording of questioning and use of scales in assessing the perceived behavioural control component of the TPB. Inferences were, therefore, drawn on the basis of individual beliefs related to control, and the power of control component of the perceived behavioural control that has been used to identify beliefs, by analysing and relating them separately to find out the contribution of factors that encourage or discourage the performance of farm forestry.

Present research highlighted the importance of the measurement (direct and indirect) and scoring (unipolar and bipolar) of the constructs of TPB by examining of tree planting behaviour. The outcome of the present study should not be used as universal application, instead a guideline to probe more on the above mentioned issues regarding different behaviour including farm forestry and other behaviours related to forestry and agriculture in particular, especially in Pakistan.

**Table 7. Reliability analysis of the direct and belief based measures of the components of TPB by using unipolar and bipolar scales.**

| TPB components | Cronbach's alpha | | |
|---|---|---|---|
| | No. of items (unipolar & bipolar scales) | Coefficients | |
| | | Unipolar | Bipolar |
| Attitude | 2 | 0.85 | 0.71 |
| Subjective norm | 2 | 0.79 | 0.69 |
| Perceived behavioural control | 2 | 0.71 | 0.32 |
| $\Sigma b_I$ | 9 | 0.62 | 0.57 |
| $\Sigma e_I$ | 9 | 0.64 | 0.51 |
| $\Sigma n_b$ | 5 | 0.67 | 0.65 |
| $\Sigma m_c$ | 5 | 0.80 | 0.78 |
| $\Sigma c_b$ | 9 | 0.45 | 0.16 |
| $\Sigma p_b$ | 9 | 0.46 | 0.12 |
| $\Sigma b_i$ x $e_I$ | 9 | 0.71 | 0.59 |
| $\Sigma n_b$ x $m_c$ | 5 | 0.80 | 0.67 |
| $\Sigma c_b$ x $p_b$ | 9 | 0.46 | 0.14 |
| $\Sigma b_I$= Belief strength | $\Sigma n_b$ = Normative beliefs | $\Sigma c_b$= Control beliefs | |
| $\Sigma e_I$= Outcome evaluation | $\Sigma m_c$= Motivation to comply | $\Sigma p_b$= Power of control beliefs | |

$\Sigma b_i$ x $e_I$ =Belief based measure of attitude (summated product of belief strength and outcome evaluation)

$\Sigma n_b$ x $m_c$ = Subjective norm (summated product of normative beliefs and motivation to comply)

$\Sigma c_b$ x $m_c$ = Perceived behavioural control (summated product of control beliefs and power of control beliefs)

**Table 8. Comparing unipolar and bipolar scales of the constructs of TPB (belief based & direct) by using correlation coefficients (spearman's rho).**

**Belief based (indirect) measures**

| No. | Constructs | Unipolor scoring | | | | Bipolar scoring | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 |
| 1. | Intention | - | 0.479** | 0.579** | 0.060$^{ns}$ | - | 0.608** | 0.373** | 0.081$^{ns}$ |
| 2. | A | - | - | 0.526** | 0.192* | - | - | 0.287** | 0.017$^{ns}$ |
| 3. | SN | - | - | - | 0.002$^{ns}$ | - | - | - | 0.151$^{ns}$ |
| 4. | PBC | - | - | - | - | - | - | - | - |

**Direct measures**

| No. | Constructs | Unipolor scoring | | | | Bipolar scoring | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 |
| 1. | Intention | - | 0.522** | 0.607** | 0.410** | - | .651** | 0.449** | 0.023$^{ns}$ |
| 2. | A | - | - | 0.723** | 0.529** | - | - | 0.511** | 0.052$^{ns}$ |
| 3. | SN | - | - | - | 0.518** | - | - | - | 0.094$^{ns}$ |
| 4. | PBC | - | - | - | - | - | - | - | - |

*, *** showing significance at .05 and .001 levels, and, ns, showing non-significance by using spearman's correlation coefficients.

## References


Ajzen, I. 1988. *Attitude, personality and behaviour*, Open University Press, Milton Keynes.

Ajzen, I. 1991. The Theory of Planned Behaviour. *Organizational Behaviour and Human Decision Process*, 50: 179-211.

Ajzen, I. and M. Fishbein. 1980. *Understanding attitudes and predicting social behaviour*, Englewood Cliffs, Prentice Hall, New Jersey.

Axelson, M.L and D. Brinberg. 1989. *A social-psychological perspective on food-related behavior*, Springer-Verlag, New York,Prentice Hall.

Bagozzi, R. P. 1984. A prospectus for theory construction in marketing. *Journal of Marketing*, 48, 11-29.

Bandura, Albert (1986). *Social foundations of thought and action: A social cognitive theory*. Englewood Cliffs, New Jersey, USA.

Carr, S. and J. Tait. 1988. Differences in the attitude of farmers and conservationists and their implications. *Journal of Environmental Management*, 32: 281-294.

Cronbach, L.J. 1951. Coefficient Alpha and the internal structure of tests. *Psychometrika*, 16: 297-334.

Geekie, M.A. 2000. *Promoting a reduction in the consumption of dietary fat: the role of perceived behavioural control, self-efficacy and personal dietary information*. Ph.D. Thesis, the University of Reading, Reading, UK.

Godin, G and G.J. Kok. 1990. The theory of planned behavior: a review of its applications to health-related behaviors, *Am. J. Health Promot.* 11 (2): 87–98.

Manstead, A. S. R. and D. Parker. 1995. Evaluating and extending the Theory of Planned Behaviour. *European Review of Social Psychology*, 6: 69-95.

McKennel, A. 1970. Attitude measurement: Use of coefficient Alpha with cluster of factor analysis. *Sociology*, 4: 227-245.

Ryan M. J. & E.H. Bonfield. 1975. The Fishbein extended model and consumer behaviour. *Journal of Consumer Research*, 2(2): 118-136.

Santos, A.J.R. 1999. Cronbach's Alpha: A tool for assessing the reliability of scales. *Journal of Extension*., 37.

Shepherd, R. (1988). Social determinants of food choice. *Proceedings of the Nutrition Society* 58, 807-812.

Stubenitsky, K. and D.J. Mela. 2000. UK consumer perceptions of starchy foods. *British Journal of Nutrition*, 83: 277-285.

(Received publication 2 February 2010)