Short Communication

A Scale to Measure Risk Behaviour of Vegetable Farmers

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Abstract
Vegetable farming is associated with many risks and uncertainties and farmers express different attitudes towards such risks. Therefore, a reliable and valid scale was developed using Likert's summated rating method in order to measure the risk attitude of vegetable farmers. The study describes the development of a scale in a stepwise manner including collection of statements, editing, item analysis and selection. Forty-two statements were selected from 95 statements, for which the 't' value was worked out. Based on the 't' value, 28 statements were selected, which form the risk attitude scale.The split-half technique was used to measure the reliability of the scale. Co-efficient of reliability of scale was found to be 0.95. The content validity was examined to determine the validity of items.Hence it was contended that the scale would prove useful in measuring the risk attitude of vegetable farmers.

Keywords: Economic behaviour, Item analysis, Risk attitude, Vegetable farmers.

Agricultural production is inherently a risky business. Uncertainties about yields and prices have direct bearing on farm productivity and profitability which constitute the most significant sources of risk for farmers. Supply chains are affected causing extensive financial and economic losses. Agricultural risks are security challenges that brings about a huge difference in actual income of farmers from expected income (Ehirim, 2006). Agricultural productivity is low that is attributed to the low level of adoption of improved agricultural technologies, risks associated with weather conditions, diseases and pests. The land holding per household is declining leading to low level of production (Bezabih and Hadera, 2007) and intensive production is the means to overcome these limitations. Vegetable production gives an opportunity for intensive production. But vegetable production is a risky farming enterprise either because of its rapid perishable nature, short supply period or its inelastic demand nature which generates adverse variation in expected outcome (Alleman and Young, 2008). The risk proneness of vegetable farming along with high uncertaintyis a great challenge for vegetable farmers (Osuji et al., 2017).

In line with this, farmer's attitude to risk have long been studied for their relevance to on and off-farm decision making. Attitude towards risk may vary greatly among individuals.When a number of people make a decision about the same uncertain situation, different preferred attitudes will be elicited depending on how individuals perceive the uncertainty (Lagerkvist, 2005). A situation which is regarded as too risky by one person will be less risky or acceptable for others (Hillson and Webster, 2007). Therefore, understanding individual attitudes

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towards risk is intimately linked to the goal of understanding and predicting economic behaviour (Bruhin et al., 2007).

Vegetable production is subject to risk, and the attitude of farmers towards risk influences their choices and these choices affect production (Picazo-Tadeo and Wall, 2010). Attitude is considered one of the main constructsthat can influence the adoption rates of vegetable technology by farmers. Hence it was thought necessary to construct a risk attitude sale for measuring risk behaviour of vegetable farmers.

Thurstone (1931) defined attitude as "the degree of positive or negative effect associated with some psychological object". Among the several techniques available to measure attitude, the Summated Rating scale method as developed by Likert (1932), and usedby Bard and Barry (2000) and by Roslan et al., (2012), was used in this study to analyse the risk attitudes of vegetable farmers.The details of steps followed in the construction of scale has been discussed below:

Collection of items

The first step in developing a scale is the collection of a number of statements/ items that reflect attitude towards the construct. Wide variation of statements can be used in risk attitude scales. It is hypothesised that attitudes towards mechanisms or tools used for managing risk reflect the producers underlying construct of a risk attitude (Hardaker et al., 2004). Hence in this study, statements on proposed risk management strategies and those describing farmer's preference or aversion to risk were included in Table 2.

Editing of items

The statements were edited following the criteria suggested by Edwards (1957). Statements that were vague, overlapping, ambiguous and irrelevant were eliminated. All possible statements which discriminated the positive and negative risk attitudes of the farmers towards vegetable cultivation were collected and included in the scale.

All the statements selected may not be relevant equally in measuring the risk attitude of vegetable farmers. Therefore, the draft containing 95 statements were sent to 45 experts in the field of Agricultural Extension, Vegetable Science and also extension officers for analysing the content, nature of the items as well as to check appropriateness of the statement to measure risk attitude. Three types of responses were given as continuum for each statement- 'Yes', 'Undecided' and 'No'. Simple percentage calculation was used to find out how many statements are accepted and how many statements are omitted. Only statements with a score of above 60 per cent were retained while those with a score of below 60 per cent were discarded. The statements were rewritten in light of the ratings and comments of the experts. Based on the response of 35 judges 42 out of 95 statements constructed were retained while 53 were rejected.

Item Analysis and Selection

Item analysis is an important step in constructing a valid and reliable scale. The acceptability of a test depends upon the care with which the items of the list have been chosen (Garrett and Wood worth, 1981). Therefore, it is important to analyse each item in order to retain only those items that form an internally consistent scale and eliminate items that do not represent the universe of study.

For constructing attitude scale, items were selected by applying t - ratio method suggested by Edwards (1957). This was done by setting of two extreme groups *i.e.*, high and low on the basis of the total scores obtained by respondents against all the statements. The selected 42 statements were introduced to a random sample of 45 vegetable farmers of non-study area. The farmers were asked to designate their degree of favourableness or unfavourableness for each statement on a five-point continuum ranging from 'strongly agree' to 'strongly

Table 1. Scoring Procedure

Options	Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree
Positive statements	5	4	3	2	1
Negative statements	1	2	3	4	5

disagree'. The score of each respondent was calculated by summing the scores given for each individual item. Twenty seven percent respondents with highest score and 27 per cent of respondents with lowest score were selected for comparison. The reason for selecting the upper 27 per cent the lower 27 per cent of the respondents for item analysis was because it proves the best compromise between desirable and inconsistent items and also to make the extreme group as large and different as possible.

Group acquiring highest score was considered as higher group and the group acquiring lowest score was considered lower group. Statement wise, mean scores of higher group and mean scores of lower groups were found out. The t-values for significance of differences between the mean attitude scores of the high and low group of respondents, that were indicative of their discrimination values, were calculated for all the 42 statements.

Itemshaving 't' value above 2.1 *i.e.*, statements significant at 0.01 level of significance were selected for the final draft of attitude scale and statements having 't' value less than 2.1 were rejected. The 't' value formula, used for item analysis was as follows,

$$t = \frac{\overline{X_H} - \overline{X_L}}{\sqrt{\frac{[(\sum f X_H{}^2) - \frac{(\sum f X_H)^2}{N}] + [(\sum f X_L{}^2) - \frac{(\sum f X_L)^2}{N}]}{N(N-1)}}}$$

$\overline{X}_H$= The mean score on a given statement for the high group

$\overline{X}_L$= The mean score on the same statement for the low group

$X_{H=}$The score of an individual for the statement in high group

X_L=The score of an individual for the statement in low group

Table 2. Selected items with t values for the final draft of attitude scale (Significant at 1 per cent level)

Sl. No.	Items	T value
1.	I concentrate mainly in one or two vegetable crops at a time (+)	4.26
2.	I usually engage in more than one enterprise (-)	6.26
3.	I have thorough and well-documented control on my crop production activities (+)	9.10
4.	I collaborate with other farmers to share risk (-)	3.14
5.	My farmed acreage is mostly consisting of less risky crops(-)	8.12
6.	I continue growing same remunerative crops year after year(-)	4.10
7.	I do not complement my farm income with non-farm income (+)	4.36
8.	I engage in less risky enterprises based on my past experiences(-)	14.02
9.	I plant only high yielding and resistant crop varieties in my farm for higher returns (-)	4.19
10.	I do not consider myself to be a low-cost producer of vegetables(+)	9.94
11.	I practice mixed farming as it ensures continuous income from farming (-)	3.13
12.	I am more likely to resort to crop diversification and multiple cropping as it reduces risk of sole cropping (-)	4.32
13.	I often experiment with new agricultural practices and technologies (+)	13.79
14.	I am always one among the first in my area to adopt a new technology (+)	16.50
15.	I use crop insurance policy as it can be a shock absorbing mechanism (-)	5.38
16.	I discuss issues related to my farm operation with professional advisors. (-)	3.07
17.	I attend all workshops and trainings to learn more about vegetable cultivation (+)	2.34
18.	I prefer "playing it safe" when growing vegetable crops andselling produce (-)	13.30
19.	I tend to avoid risk choices when making on farm decisions even though this may result lower returns (-)	7.26
20.	I do not think about the consequences when doing farming out of passion (+)	4.55
21.	I am hesitant to adopt agricultural innovations, until I see theiradvantages and disadvantages from farmers around me (-)	3.94
22.	I am concerned about existing profit more than several predicted and non-guaranteed profit (-)	14.01
23.	To implement my farm plan goals, I take risks more than others(+)	10.79
24.	I adopt technologies which are famous among fellow farmers(+)	6.49
25.	I do not produce to the highest possible quality if it means higher costs (-)	4.33
26.	I do not stop trying even if failures come my way (+)	3.07
27.	I continue vegetable farming thinking that even if I suffer huge loss one-time, next time I will be able to overcome it (+)	8.29
28.	I am able to minimize the consequence of risk in vegetable cultivation by proper planning (+)	8.29

On the basis of the t values obtained, 28 statements were selected for the final draft of attitude scale constructed to measure the risk attitude of vegetable farmers as shown in Table 2. The final form of scale had 13 positive statements and 15 negative statements.

Standardisation of scale

An attitude statement may prove undifferentiating. It could be due to different reasons like that it involves a different attitude continuum or the statement may be responded in the same way by the entire group or the statement may be so expressed by the members of the group in a way that it is misunderstood, being poorly stated and phrased with unfamiliar words. Hence, standardisation becomes essential. A scale is said to be standard only when it has validity and reliability. A well-constructed scale should yield accurate and consistent results. Reliability refers to the ability of a test to produce consistent scores from one set of measure to another. Validity is the extent to which a test measure that it is supposed to measure.

Reliability of the scale

Reliability refers to the consistency of the scores obtained by the same persons when re-examined with the same test on different occasions, or with different sets of equivalent items, or under other variable examining conditions (Annastasi,1976; Kerlinger, 1973). The greater the degree of consistency and stability in an instrument, the greater its reliability (Kumar, 2014).

There are several methods to calculate reliability of the scale. In the present study, split half procedure to estimate the internal consistency was administered on asample of 45 vegetable farmers. Even though there are many options on how to split theitems, the common option is to compare odd and even-numbered items from the measurement procedure. The 28-item scale was split into two halves using odd– even method. The scores from each of the halves was calculated separately by using SplitHalf test reliability coefficient which was computed by Pearson 'Product Moment Method.

$$r½ = \frac{N\sum XY - \sum X \sum Y}{\sqrt{[N\sum X^2 - (\sum X)^2][N\sum Y^2 - (\sum Y)^2]}}$$

Where, $r½$= split half reliability X= score of odd items Y= score of even items From the self-correlation of the half- tests, the reliability coefficient of the whole test was estimated by using the Spearman-Brown Prophecy formula.

$$R = \frac{2r½}{1+r½}$$

Where, R= Reliability coefficient of whole test $r½$ = split half reliability coefficient

$$r½ = \frac{45\times 90475 - 1952*2008}{\sqrt{[(45*88622) - (1952)^2][45*92952 - (2008)^2]}} = 0.92$$

$$R = \frac{2\times 0.92}{1+0.92} = 0.95$$

The reliability coefficient was found to be around 0.95, and hence attitude scale proved to be highly reliable.

Validity of the scale

Content validity measures the degree to which the test items represent the domain or universe of the trait being measured.This form of validity is based upon judgement of several subject experts (Lawshe, 1975). Here after the items were constructed, the draft was given to experts in the field of Agriculture for analysing the content, language, nature of the items as well as for editing the statements. Based on their suggestions and useful recommendations, the statements were modified accordingly and some of them were rejected. Item analysis was also carried out where only items with't' value above 2.01 at 0.01 level of significance were selected. Therefore, the scale proved to have content validity.

An attitude scale can act as a cost-effective and easy to administer instrument for gathering baseline data. The future success of vegetable farming will depend on the ability of the farmers to respond to complex production problems with knowledge intensive solutions. A positive risk attitude would facilitate a farmer to acquire, process and use increasingly innovative solutions. A negative attitude, on the other hand will be deterrent to the process. Ascertaining the attitude of farmers towards risk tend to display their risk behaviour and coping strategies.

The scale was developed in a stepwise manner *i.e.,* starting from collection of statements, editing, item analysis and finally selection of statements. The coefficient of reliability was found to be 0.95 which was fairly high and the scale was found to have content validity as every selected statement was an expression of positive and negative attitude towards risks in vegetable production, agreed by more than 60% of the judges. A major component of decision analysis under

risk in farming is reliable knowledge about the risk attitudes of key decision makers. Since attitude is a crucial element in human behaviour, the scale developed in this connection would help government or any other stakeholders in designing behavioural interventions in rural areas. Further, the scale could be used to measure farmer's attitude beyond the study area with suitable modifications.

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