Original Research Article

Development of Scale to measure the Behavioural Intention of Farmers to Adopt Nutrition Sensitive Agriculture

ABSTRACT

A scale was developed to measure the "Behavioural intention of farmers to adopt Nutrition Sensitive Agriculture (NSA)". Based on the review of literature and discussion with the expert's, 74 statements were enlisted. The Likert's summated rating technique was followed in the construction of scale. The list of 74 statements was sent to a panel of 120 experts with the request, to critically evaluate each statement for itsrelevancy to measure thebehavioural intention of farmers to adopt Nutrition Sensitive Agriculture. Out of 120 expertsselected for the scale construction, 40 experts responded in time and at the earliest. Based on their judgment an aggregate of 40 statements was selected. Statements having Relevancy Weightage ≥0.80 and Mean Relevancy Score ≥2.4 were considered for the item analysis. In item analysis, the selected 40 statements were administered on 40 farmers in the non-sample area. Finally, a total of 24 statements were selected for the study, based on the‘t’ values (> 1.75) resulted from the item analysis and were included in the final scale. The ‘R’ value of the scale was found to be 0.732 and the value of Cronbach’s alpha found to be 0.776 which was significant at 1% level indicating the high reliability. Hence, the scale developed wasfound to reliable and valid. Thus, the

instrument developed to measure the behavioural intention of farmers to adopt Nutrition Sensitive Agriculture.

Keywords: Nutrition Sensitive Agriculture, Behavioural Intention, Item Analysis, Reliability and Validity.

INTRODUCTION

Food and nutrition are basic human necessities, and having access to them is even more important for a typical person's total development and growth. Poverty, hunger, and malnutrition are major issues in India, affecting a large portion of the population. The Green Revolution decreased poverty and hunger while increasing food production. But still India had 38.4 percent stunted children below five years, 35.7 percent underweight, 21 percent wasted, and 58.4 percent suffering from anaemia in 2015–16 [1] along with a significant rural–urban gap in this regard. 41.2 percent children below five years are stunted in rural India vis-`a-vis that of 31 percent in urban areas. Similarly, the rural–urban gaps in respect of underweight, wasted and anaemia are 9.2 percent, 1.5 percent and 3.5 percent respectively. Further, around 53 percent women of 15–49 years' age suffer from anaemia, while only one-fourth of men have similar problem [1]. However, around 23 percent of both women and men ofthis age group have the Body Mass Index (BMI) below normal level. Thus, malnutrition in India poses a serious challenge. Several socio-economic and institutional factors influence malnutrition and micronutrient deficiency [2] and integrated development of agriculture, environment, healthcare, etc. can potentially address the problems [3]. In this context, developing linkages between agriculture and nutrition becomes crucial [3, 4]. Agriculture has the potential to play a promising role in combating malnutrition,

according to. It can help improve food security and make food more affordable by increase in productivity and lowering prices [5], to increase nutritional security, there must be location-specific, diverse, and strategic agricultural production and extension that can boost nutrition, resulting in a more productive workforce [6]. Nutri-Sensitive approaches to agriculture are considered key to achieving food security and good nutrition [7], Nutrition Sensitive Agriculture (NSA) broadly focuses on cultivation and consumption of nutritious foods along with diversification of diets and food fortification [8]. Often appropriate agricultural practices improve nutritional status of people [9]. Diverse food production can modify the dietary patterns and make output and income stable. Nevertheless, interventions to promote availability, access and consumption of nutritious foods need adequate emphasis. It is, therefore, necessary to understand, farmers' behaviour towards the adoption of Nutrition Sensitive Agriculture (NSA)[10]. Nutrition-Sensitive Agriculture is an approach that seeks to ensure the production of a variety of affordable, nutritious, culturally appropriate and safe foods in adequate quantity and quality to meet the dietary requirements of populations in a sustainable manner [11]. This approach stresses the multiple benefits derived from enjoying a variety of foods, recognizing the nutritional value of food for good nutrition, and the importance and social significance of the food and agricultural sector for supporting rural livelihoods [12].

The success or failure of Nutrition Sensitive Agriculture (NSA) to a great extent depends on the behavioural intention of its clientele. By measuring the Behavioural intention of farmers to adopt Nutrition Sensitive Agriculture (NSA), it will provide input to the policy makers for desirable change in existing system. But many circumstances exist in which researcher is not able to find an adequate scale to measure an important concept. In these circumstances, it is essential

to create a new scale as it revealed that failure to carefullydevelop a measurement instrument can result in invalid data [13]. Therefore an attempt has been made to develop a scale to measure the Behavioural intention of farmers to adopt Nutrition Sensitive Agriculture (NSA).

MATERIALS AND METHODS

To measure behavioural intention of farmers to adopt NSA, Likert's Scale (method of Summated Rating) was followed. Construction of scale was started with collection of items exploring the universe of structural and functional mechanism and its relation with Nutri-Sensitive Agriculture through literature survey and discussion with experts. The Edwards' 14 criteria for developing statements was followed with due consideration. Validity of statements was measured by juries' (experts) opinion through relevancy test (Relevancy Weightage and Mean Relevancy Score). After initial screening of statements, item analysis was done with 40 subjects (A group of respondents of non- sampled area). Final scale was developed with "t" value (> 1.75) criteria according to Likert Scale. Reliability of scale was measured by Split half test and Cronbach alpha test. Besides other methods of validity and reliability test were briefed for further suitable tests in future use.

The steps for construction of scale to measure behavioural intention of farmers to adopt Nutrition Sensitive Agriculture are as under:

Collection of items

A boundary of the universe about the opinion of farmers towards adopting Nutrition-Sensitive Agriculture was outlined through available literature and discussion with experts at various institutes and universities. A tentative list of 74 statements was drafted keeping in view the applicability of statements suitedto the area of study.

Statements for the behavioural intention of farmers to adopt Nutrition Sensitive Agricultre were collected using "Theory of Planned Behaviour" (TPB) by Ajzen [14]. The theory was intended to explain all behaviours over which people can exert self-control. Behavioral Intentions are influenced by the attitude about the likelihood that the behavior will have the expected outcome and the subjective evaluation of the risks and benefits of that outcome.

Table.1: Variables under Theory of Planned Behaviour (TPB)

S. No	Variable	Definition	Operational definition
1	**Attitude toward Behaviour**	This refers to the degree to which a person has a favourable or unfavourable evaluation of the behaviour of the interest. It entails a consideration of the outcomes of performing the behaviour.	Attitude in the present study is operationalized as the farmer's favourable or unfavourablebehaviour towards adopting Nutrition Sensitive Agriculture.
2	**Subjective Norms**	This refers to the belief about whether most people approve or disapprove the behaviour. It relates to a person's belief about whether peers and people of importance to the person think he or she should engage in the behavior.	Subjective norms are seen as farmer's conviction that how other people think about their adoption of Nutrition Sensitive Agriculture.
3	**Perceived Behavioural Control**	This refers to a person's perception of the ease of difficulty of performing the behaviour of interest. Perceived Behavioural Control varies across situations and actions, which results in a person having varying perceptions of behavioural control depending on this situation	Perceived easiness or difficulty with which farmer associates with adoption of Nutrition Sensitive Agriculture.
4	**Behavioural Intention**	This refers to the motivational factor that influences a given behaviour where the stronger the intention to perform the behaviour the more	Farmer's perceived likelihood or subjective probability that he or she will engage in the adoption of Nutrition Sensitive Agriculture.

		likely the behaviour will be performed.	

The TPB postulates that behavioral intention is influenced by Attitude toward Behavior, Subjective Norms and Perceived Behavioral Control[15].

Editing of items

According to 14 informal criteria suggested by Edwards [16], the statements were carefully edited. Utmost care was taken so that the statements could measure what it is intended.

Relevancy Test

The statements prepared and collected may notbe equally relevant in measuring the behavioural intention of farmers to adopt Nutrition Sensitive Agriculture. So these statements werescrutinized by panel of judges todetermine the relevancy and screening for inclusion in the final scale.Judges comprised experts in the field ofagricultural extension of ICARResearch Institutes, State Agricultural Universities, scientists of collaborating Krishi Vigyan Kendra and Agricultural Officers of State Agricultural Department who are involved in Nutrition Sensitive Agriculture were taken as judges for therelevancy of statements.The statements were sent to 120 judges with a request to criticallyevaluate each statement and give their response in three-point continuum viz. most relevant,relevant and not relevant with unipolar scores 3, 2 and 1, respectively.Out of 120 judges, only 40 responded in a time period of one and half months. The relevancy score ofeach item was established by adding the scoreson the rating scale for all the 40 judges' responses. From these data, two types of tests (relevancy weightage and mean relevancy scores) were worked out for all the statements by using different formulas [21]:

$$\text{Relevancy Weightage} = \frac{(\text{Most Relevant} \times 3)+(\text{Relevant} \times 2)+(\text{Not Relevant} \times 1)}{\text{Maximum Possible Score}}$$

$$\text{Mean Relevancy Score} = \frac{(\text{Most Relevant} \times 3)+(\text{Relevant} \times 2)+(\text{Not Relevant} \times 1)}{\text{Number of Judges}}$$

In the screening statements having relevancy weightage ≥0.80 and mean relevancy score ≥2.4 were considered for the final selection of statements. Also repetition and duplication type statements opined by judges were relooked. By this process, out of total seventy four (74) statements, thirty four (34) statements were discarded and finally, forty (40) statements were retained for further item analysis.

RESULTS AND DISCUSSION

Item Analysis (Calculation of t-value)

The purpose of an item analysis is to find thoseitems that form an internally consistent scale and toeliminate those items that do not represent theuniverse of study [17]. The item analysisprovides evidence about how well eachindividual item relates to the other item in theanalysis. Similarly, Anderson [18] used atechnique for determining the discrimination ofitems in a test and reported that onemeans of item analysis was possible to build atest that had almost as great reliability as alonger examination containing poor items. Likert[19] also suggested a second objective methodfor the assignment of correct scale values andfor determining whether the items weredifferentiating. This criterion was designated asthe criterion of internal consistency. The finalforty (40) statements after the relevancy testwere subjected to item analysis to delineate theitems based on the extent to which they candifferentiate the respondents with favourable opinion than the respondents with an unfavourable opinion towards Nutrition Sensitive Agriculture. A pilot study was done with 40 farmers of Nutrition Sensitive Agriculture intervention in Nuapada district of Odisha. The respondents were asked to indicate their degree of

agreement or disagreement with each statement on a five - point continuum viz., strongly agree, agree, undecided, disagree and strongly disagree with scores of 5, 4, 3, 2 and 1, respectively.

The respondents' responses were recorded, and the summated score for the total statements of each respondent was obtained. Based upon the total score, the respondents were organized in descending order. The top 25 percent of the respondents with their total scores were considered as the high group and the bottom 25 percent as the low group, as these two groups provide criterion groups in terms of evaluating the individual statements as suggested by Edwards [20]. Thus out of 40 respondents, 10 respondents with lowermost and 10 respondents with uppermost scores were used as criterion groups to evaluate individual items. The critical ratio, that is the t value (which is a measure of how significantly a given statement could differentiate between the high and low groups of the respondents for each statement) was calculated by using the formula suggested by Edwards [20].

$$t = \frac{\overline{X}_H - \overline{X}_L}{\sqrt{\frac{\sum(X_H - \overline{X}_H)^2 + \sum(X_L - \overline{X}_L)^2}{n(n-1)}}}$$

Where, $\sum(X_H - \overline{X}_H)^2 = \sum(X_H)^2 - \frac{(\sum X_H)^2}{n}$ and

$\sum(X_L - \overline{X}_L)^2 = \sum(X_L)^2 - \frac{(\sum X_L)^2}{n}$

$\overline{X}_H$ = Mean score of given statement in High group

$\overline{X}_L$ = Mean score of given statement in Low group

$\sum (X_H)^2$ = Sum of squares of the individual score on a given statement for High group

$\sum (X_L)^2$ = Sum of squares of the individual score on a given statement for Low group

$\sum X_H$ = Summation of scores on given statement for High group

$\sum X_L$ = Summation of scores on given statement for Low group

n = Number of respondents in each group

Selection of the statements for inclusion in Final Scale

After calculating the 't' value, the statements with't' values greater than 1.75 were finally selected and included in the behavioural intention scale. It was observed that twenty four (24) statements (Table. 2) were found to be having the values of more than 1.75. According to Edwards [20], Likert suggested that the 't' value above 1.75 of any item had high discriminating power, which could be placed in the final attitude scale [21]. Therefore, the finalscale consisted of 24 items which were finally includedin the study.

For standardization of the scale, reliability and validity of the scale were determined as follows:

Reliability of the Scale

A scale is said to be reliable when it consistentlyproduces the similar results whenapplied to the same sample at different times. The reliability of a test indicates the credibility ofscores obtained. The reliability of a test is anexpression of both the stability and consistencyof test scores [22]. Reliability coefficientis represented by a numerical value between 0 and 1 reflecting the stability of the instrument.

In the present study, Cronbach's alpha was used to get more stability and accuracy. It is a function of thenumber of items in a test, the averagecovariance between pairs of items, and thevariance of the total score. Theresulting α coefficient of reliability ranges from 0to 1 in providing this overall assessment of ameasure's reliability. If all of the scale items areentirely

independent from one another (i.e., arenot correlated or share no covariance), then α =0; and, if all of the items have high covariance,then α will approach 1 as the number of items inthe scale approaches infinity. In other words, thehigher the 'α' coefficient the more the items haveshared covariance and probably measure the same underlying concept [21].

Here, the Cronbach alpha value was 0.776, which indicatedmoderately high reliability in the case of Socialsciences. Here the reliability was tested bymeans of the split-half method. The scale wasadministered to 40 non-sample respondents(other than the study area) and was divided intotwo halves based on odd and even number of statements. The total scores obtained for oddand even numbered items were subjected to correlation analysis. Pearson product moment correlation coefficient is obtained on the scores of even numbered items and the scores of odd numbered items. The resulting coefficient is the split half reliability. Based on the analysis, it was found that the split half reliability was 0.577. To adjust the split half reliability in to full test reliability, for example, on a 24 item test, 12 of the items would be correlated with the 12 other items with each set of correlated items having similar content. In effect, correlation would occur between paired scores based on scores from two 12 item tests. However, the reliability for the total 18 item test is needed. That's why; the useof the Spearman Brown (SB) formula approximates the reliability for the total test. Oneform of the Spearman Brown formula [23] is shown below:

$r_{tt} = nr_{11} / 1 + (n\text{-}l)\, r_{11}$

Where 'n' is the ratio of the number of items onthe desired test to the number of items on the original test and r is the already obtained reliability for the partial test. The Spearman-Brown

formula can also be utilized to estimate reliabilities obtained by the test-retest and alternate forms methods [21]. Alternately, Spearman Browns prophecy formula can be used asfollows:

Reliability = 2 × r half test1+r half test

The full test (24 items) reliability was 0.732 and found to be significant at one percent level of significance ($p<0.01$). Since the reliability value was more than 0.7, the scale was considered to be highly reliable.

Validity of Scale

Validity is an indication of how well a test measures what it is designed to measure [22].A test can be valid for one group butinappropriate for another. Validity involves gathering and evaluating information for determining how well test measures what its author's purport it measures. The present scale was examined for content validity.

According to Kerlinger [24], the content validity is the representative or sampling adequacy of the content, the substance, the matter and the topics of a measuring instrument. The content validity was determined by a group of experts. Since the items selected were from the universeof content, it was ensured that the items coveredthe various aspects of the behavioural intention of the farmers to adopt Nutrition Sensitive Agriculture. The differential validity or commonly called as Known Group Method was used to testthe construct validity of the instrument[21]. This method was applied to test whether the developed scale could discriminate between the individuals who have and those who haven't the degree of agreement with each statement towards Nutrition Sensitive Agriculture. The pilot testing exposed that the scale could differentiate the people having the degree of agreement with each statement towards Nutrition Sensitive Agriculture. As the scale value difference for almost all the statements included had a

very high discriminating value, it seemed reasonable to accept the scale as a valid measure of the attitude. Thus it ensured a fair degree of validity.

Administration of the Scale

The final scale that would measure farmers' behavioral intention to adopt Nutrition Sensitive Agriculture consisted of 24 statements. Each statement would be noted on a seven-point continuum as strongly agree, agree, slightly agree, undecided, slightly disagree, disagree, strongly disagree with scores of 7, 6, 5, 4, 3, 2, and 1, respectively for positive statements. Reversed scoring would be done in the case of negative statements. Likert scales would measure the respondents' opinions by checkinghow strongly they agree or disagree with the statements**.**

Using the multiple regression or structural equation analysis, we can determine the relative contribution of attitudes, subjective norms, and perceptions of behavioural control to predict the intentions. In addition, the scale would assess behavioural beliefs, normative beliefs, and control beliefs. By measuring these beliefs, we can gain insight into the underlying cognitive foundation, i.e., we can explore why people hold certain attitudes, subjective norms, and perceptions of behavioural control. The beliefs would provide a "snapshot" of the behaviour's cognitive foundation in a given population at a given point of time.

CONCLUSION

The standardized scale would have practicalapplicability in ascertaining the direction andintensity of behavioural intention of farmers andthereby, it facilitates to take right decisions by policy makers. This ishighly effective in the quantification of behavioural aspects like attitude, subjective norms, perceived behavioural control and intention. The scale is a reliable onewhich is an asset for further study of farmers'behavioural intention towards the Nutrition Sensitive

Agriculture in different timeby different farmers. It can be used extensivelyby further validating the scale in meeting severalfuture innovative extension methods. Therelevancy analysis points out that selected items are highly relevant and statistically significant. Thescale can be modified to measure the behavioural intention offarmers towards other linkage mechanisms in theprovision of agricultural extension services.

Table 2: Standardized scale to measure the behavioural intention of farmers to adopt Nutrition Sensitive Agriculture (NSA)after item analysis

S. No	STATEMENTS	't' value
ATTITUTE		
1	I think that adopting NSA for nutritional security is valuable	4.00
2	I think that adopting NSA for nutritional security is profitable	2.68
3	I think that adopting NSA for nutritional security is desirable	2.09
4	Adopting NSA give me an opportunity to achieve nutritional security	3.50
8	Adopting NSA increases the diversity of food available within the household	2.06
9	For me, NSA increases my family income	2.41
11	For me, NSA help to generate market level demand for nutri-rich foods	1.91
SUBJECTIVE NORM		
1	Most people who are important to me think that I should adopt NSA	2.50
2	Most people whose opinion I value would approve me to adopt NSA	1.99
3	Most farmers in my village with whom I am acquainted had started to adopt NSA	2.18
4	When it comes to adopting NSA, I care about what the instructor of NSA thinks I should do	1.77
5	When it comes to adopting NSA, I care about what my fellow farmers think I should do	1.97
6	My parents think that I should adopt NSA on a regular basis	3.64
7	My partner think that I should adopt NSA on a regular basis	2.49
PERCEIVED BEHAVIOURAL CONTROL		
1	I am confident that I can adopt NSA when I want	4.23
2	Adopting NSA is completely up to me	2.61
3	If I have adequate knowledge and competencies about NSA, it would make it easier to adopt.	2.68
4	Appropriate package of practices and support on my field would make it easier to adopt	2.15
5	Financial and structural barriers prohibits me from adopting NSA	2.45
6	If NSA imposes extra cost, it would make more difficult for me to adopt NSA	2.19
7	Sometime family obligations place unanticipated demands on adopting NSA	2.50
INTENTION		
1	I intend to adopt NSA because of its positive contribution for my health	3.29

2	I am planning to adopt NSA	1.82
3	I am sure that I will make an effort to adopt NSA	3.03

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