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Construction of Knowledge Test to Measure the Knowledge on Recommended Groundnut Production Practices

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ABSTRACT

The non-availability of a standardized scale to measure the farmers' knowledge level influenced the researchers to construct a test for measuring the knowledge on recommended groundnut production package of practices. Pertinent items were collected covering all aspects from the crop production guide developed by the Department of Agriculture, Govt. of Tamil Nadu & Tamil Nadu Agricultural University. After getting jury opinion on the items, test index of item difficulty, index of item discrimination and point biserial correlation for the items were worked out. All these were taken in to account to arrive at the final scale. While administrating the knowledge test a respondent was given one mark for each correct answer and zero for wrong answer. Eleven (11) items were finally selected from a total of fifty five (55) items.

***Keywords**: Knowledge test; unreached farmers; recommended practices; Groundnut; Tamil Nadu.*

INTRODUCTION

In the present study, knowledge was operationalized as the quantum of information known to the unreached farmers on recommended groundnut production package of practices in order to lead a sustainable life. A knowledge test was developed with eleven (11) items to measure the knowledge of unreached farmers on recommended practices. Each item was measured on two point continuum viz., correct and incorrect with '1' and '0' score respectively. The possible maximum and minimum scores to be obtained by unreached farmers were 11 and 0 respectively. The detailed procedure followed for the construction and standardization of the knowledge test is shown below.

METHODOLOGY

Collection of items

On perusal of relevant literature and discussion with the experts in extension & biological sciences, a total of 74 items were collected focusing on various aspects of groundnut cultivation *i.e.*, crop improvement, production and protection by referring to the crop production guide of the Department of Agriculture, Govt. of Tamil Nadu & Tamil Nadu Agricultural University. Experts in the field of Agronomy and Agricultural Entomology of Prof. Jayashankar Telangana State Agricultural University, Hyderabad were consulted for screening, fine tuning and editing of the items. Based on the opinion of the scientists,

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a total of fifty five (55) items were retained. These retained fifty five (55) items were then subjected to item analysis to have suitable items to be included in the final schedule based on the opinion of the respondents from non-sample area.

Item analysis

The item analysis was carried out in terms of three indices viz., item difficulty index, item discrimination index and point-biserial correlation. The index of item discrimination provides information on how well an item discriminates well informed respondents from poorly informed. Whereas item difficulty index indicates the extent to which an item was difficult. The main aim of calculating Point biserial correlation (rpbis) was to work out the internal consistency of the items *i.e.*, the relationship of the total score to a dichotomized answer to any given item.

Difficulty index (P)

The selected items (55 items for groundnut) were administered to 60 non-sample respondents with two point continuum response for each statement. The scores allotted were one (1) for correct response and zero (0) for incorrect response. After computing the total score obtained for each of the 60 respondents on items, they were arranged in order from highest to lowest. Based on which the 60 respondents were then divided into six equal groups. These groups were labelled as G1, G2, G3, G4, G5 and G6 with 10 respondents in each group.

For the purpose of item analysis, the middle two groups G3 and G4 were eliminated keeping only four extreme groups with high and low scores. The index of 'Item difficulty' was worked out as the percentage of the respondents answering an item correctly. The items with 'p' values ranging from 30.0 to 70.0 were considered for the final selection of the knowledge test. For each item the correct answer was calculated to get the difficulty index. The results are presented in Table 1.

$$\text{Difficulty Index} = \frac{\text{Total number of correct answers}}{\text{Total number of respondents}}$$

Discrimination Index (E 1/3)

S1, S2 and S5, S6 are the frequencies of correct answers in the groups G1, G2, G5 and G6 respectively. 'N' is the total member of respondents of the sample selected for the item analysis that is 60. The discrimination index varies from 0 to 1. The items with discrimination index ranging from 0.30 to 0.70 were selected for the final test. This shows whether the items actually distinguished a well-informed person from one who is inadequately informed about the subject matter. The formula used was as below. This is the second criterion for item selection *i.e.*, by the item discrimination index indicated by 'E 1/3' is calculated with the formula. The results are presented in Table 1.

$$\frac{(S1+S2) - (S5+S6)}{N/3} \quad \text{(or)}$$

$$D = \frac{R_u - R_l}{N}$$

Where,

D	:	Discrimination Index
R_u	:	Frequency of correct answers in high knowledge group
R_1	:	Frequency of correct answers in low knowledge group
N	:	Total number of respondents in sample taken for item analysis

Point Biserial Correlation (r_{pbis})

The main aim of calculating point biserial correlation (r_{pbis}) was to work out the internal consistency of the items i.e., the relationship of the total score to a dichotomized answer to any given item. It is the correlation between right/wrong scores obtained by farmers in the non-sample area (Tiruvannamalai district of Tamil Nadu) on a given set of items. It is a special type of correlation between a dichotomous variable (the multiple-choice item score which is right or wrong, 0 or 1) and a continuous variable (the total score on the test ranging from 0 to the maximum number of multiple-choice items on the test). Like in all correlations, point-biserial values range from -1.0 to +1.0. A large positive point-biserial value indicates that farmers with high scores on the overall test are also getting the item right and farmers with low scores on the overall test are getting the item wrong (Seemavarma,2015). The results are presented in table 1.

Computation and interpretation of Point-Biserial Correlation

The scores obtained by the farmers are arranged in matrix comprised of 55 items. The items were represented in the matrix columns from left to right and farmers represented as rows. A value of '1' was assigned to correct response and '0' for wrong. The steps followed for computing Point-Biserial Correlationare 1. computed the total farmers score for each items 2.computed the total score minus each item score, 3.computed the Point-Biserial Correlation for each item using the 'CORREL' function.

A low point biserial implies that the farmer got the items incorrect. Therefore, items with low-point-biserial correlation values need further examination. It was reported by Seemavarma (2015) that the wordings, presentation or content of such items may explain the low point-biserial correlation. However, even if nothing appears visibly faulty with the items, it is recommended that they may be removed from scoring and future testing or may even be removed from final set of questions that may be included in the interview schedule. It is always recommended to use a minimum threshold value for the point-biserial correlation. A point biserial value of at least 0.15 is recommended (Seemavarma, 2015) though experience has shown that a very good number of items have point-biserial correlation value.

Point biserial correlation: item discrimination

The items to be considered for final inclusion into the interview schedule were based on its point biserial correlation value. Penn (2009) and McGahee and Ball (2009) have categorized items based on items point biserial correlation value i.e., the items which possess the point biserial correlation value

of 0.20 and below said to be 'poor' and need revision, 0.20 - 0.29 said to be 'fair', 0.30 - 0.39 said to be 'good' and 0.40 - 0.70 said to be 'very good'. In the present study, the items which belong to 'very good' category (i.e., the items with point biserial correlation value of 0.40 – 0.70) were selected for final inclusion in the interview schedule.

Table 1.
Calculation for Selection of Suitable Knowledge Items for Groundnut Crop

Sl. No.	Frequencies of correct answer of respondents in four extreme groups				Total frequencies of correct answers by all six groups	Percent of giving correct responses	Difficulty index (P)	Discrimination index (E 1/3)	r_{pbis}
	G-1	G-2	G-5	G-6					
1	10	6	4	4	40	66.67	60.0	0.70	0.387
2*	10	10	0	2	32	53.33	55.0	0.65	0.611
3*	10	9	3	4	40	66.67	65.0	0.65	0.484
4	6	5	2	4	23	38.33	42.5	0.05	0.213
5	8	7	8	2	34	56.67	62.5	0.05	0.189
6	10	9	8	6	50	83.33	82.5	0.80	0.308
7	8	9	2	1	30	50.00	50.0	0.75	0.437
8*	7	7	1	1	26	43.33	40.0	0.35	0.426
9*	9	10	4	3	34	56.67	65.0	0.35	0.425
10	10	8	6	6	45	75.00	75.0	0.60	0.254
11	9	6	3	3	27	45.00	52.5	0.30	0.330
12*	9	10	7	2	45	75.00	70.0	0.70	0.446
13	8	9	2	3	29	48.33	55.0	0.25	0.378
14	6	7	8	4	35	58.33	62.5	0.40	0.074
15	8	6	2	3	34	56.67	47.5	0.45	0.304
16	5	3	1	4	14	23.33	32.5	0.10	0.196
17	10	4	3	3	28	46.67	50.0	0.40	0.345
18	10	6	0	6	31	51.67	55.0	0.50	0.330
19	10	5	3	3	28	46.67	52.5	0.45	0.374
20	9	8	2	4	35	58.33	57.5	0.65	0.308
21	5	4	2	2	23	38.33	32.5	0.05	0.217
22	8	5	3	5	26	43.33	52.5	-0.10	0.172
23	9	7	8	7	45	75.00	77.5	0.65	0.103
24*	10	5	1	2	19	31.67	45.0	0.40	0.525
25	6	7	3	4	28	46.67	50.0	0.30	0.197

Sl. No.	Frequencies of correct answer of respondents in four extreme groups				Total frequencies of correct answers by all six groups	Percent of giving correct responses	Difficulty index (P)	Discrimination index (E 1/3)	r_{pbis}
	G-1	G-2	G-5	G-6					
26*	9	8	6	1	39	65.00	60.0	0.55	0.491
27	8	6	4	2	28	46.67	50.0	0.35	0.348
28	9	5	3	4	24	40.00	52.5	0.40	0.311
29*	9	5	5	1	25	41.67	50.0	0.50	0.412
30	8	7	10	3	45	75.00	70.0	0.50	0.242
31	8	7	3	2	35	58.33	50.0	0.35	0.381
32	8	3	4	4	23	38.33	47.5	-0.05	0.213
33	9	7	8	4	42	70.00	70.0	0.55	0.239
34	9	3	3	2	22	36.67	42.5	0.20	0.402
35	8	3	3	5	30	50.00	47.5	0.15	0.156
36	9	6	3	5	37	61.67	57.5	0.10	0.235
37	10	6	8	5	47	78.33	72.5	0.55	0.287
38*	9	7	4	1	28	46.67	52.5	0.30	0.426
39	9	6	6	4	41	68.33	62.5	0.40	0.263
40	10	7	4	3	26	43.33	60.0	0.70	0.391
41	7	3	1	2	18	30.00	32.5	0.25	0.309
42	9	4	3	2	30	50.00	45.0	0.00	0.350
43	9	8	7	6	49	81.67	75.0	0.40	0.212
44	10	6	5	4	38	63.33	62.5	0.70	0.324
45	6	7	0	2	21	35.00	37.5	0.05	0.363
46	10	6	9	3	44	73.33	70.0	0.50	0.328
47	9	4	5	1	30	50.00	47.5	0.35	0.387
48	8	5	2	4	27	45.00	47.5	0.15	0.180
49	9	9	8	2	41	68.33	70.0	0.40	0.353
50	9	8	8	2	46	76.67	67.5	0.20	0.411
51	9	6	9	4	46	76.67	70.0	0.30	0.344
52*	10	6	9	1	40	66.67	65.0	0.30	0.406
53*	10	8	6	4	44	73.33	70.0	0.35	0.416
54	8	8	8	3	43	71.67	67.5	0.65	0.301
55	5	6	3	0	28	46.67	35.0	0.55	0.331

* Items selected for final inclusion

Item selection

The items with difficulty level indices ranging from 30.0 to 70.0, discrimination indices ranging from 0.30 to 0.70 and the items with point biserial correlation ranging from 0.40 to 0.70 levels were selected finally to include in the interview schedule for assessing the level of knowledge of unreached farmers on recommended crop production package of practices. A total of 11 knowledge items for groundnut were finally selected (Table 2).

Thus, the finally selected knowledge test items comprised different types of questions viz., multiple choice questions, yes or no type questions, true or false, fill up the blanks and direct one word answer. The selected items with frequency of correct response, P, E1/3 and Rpbis values were included in the scale.

Reliability of Knowledge test

According to Kerlinger (1973) "Reliability is the accuracy or precision of measuring instrument". To know the reliability of the items the Split-Half method was followed.

Split-Half Methodology

The reliability of the scale was determined by split-half method. The selected items i.e., eleven (11) items were divided into two halves. The two halves were further administered separately to 30 unreached farmers in a non-sample area (Tiruvannamalai district of Tamil Nadu) The scores were subjected to product moment correlation test in order to find out the reliability of the scale. The half-test reliability co-efficient (r) was 0.356. Further, the reliability co-efficient of the whole test was computed using the Spearman Brown Prophecy formula (Singh, 1986) given below.

$$\text{Reliability co-efficient of whole test} = \frac{\text{2x Reliability co-efficient of half test}}{\text{1+Reliability co-efficient of half test}}$$

The whole test reliability co-efficient of the whole test was computed using the Spearman Brown Prophecy worked out and the results were 0.526 for the items selected for groundnut crop. According to Singh (1986), when the mean scores of the two groups are of narrow range, reliability co-efficient of 0.50 or 0.60 would be sufficient. Hence, the constructed scale to assess unreached farmers knowledge was considered reliable.

Validity of the test items

The validity of the test items was tested by the method of correlation coefficient (r) and content validity. The items which belonged to 'very good' category (i.e., the items with point biserial correlation value of 0.40 – 0.70) were considered to measure the knowledge of the unreached farmers on recommended crop production package of practices. Also the content validity of the knowledge test was derived from a long list of test items representing the whole universe on recommended crop production package of practices on groundnut.

It was assumed that the score obtained by administering the knowledge test of this study measures what was intended to

measure. Thus, the knowledge test developed, exactly measures the knowledge of unreached farmers on recommended crop production package of practices of groundnut as it showed a greater degree of reliability and validity.

FINDINGS AND DISCUSSION

Table 2 represents the final knowledge items selected for assessing the knowledge level of farmers on recommended crop production package of practices on groundnut crop. The scale standardized may be directly used by a researcher for assessing knowledge level of farmers on recommended groundnut production of practices. The items selected finally using standard procedures includes different aspects of crop production and different form of questions viz., multiple choice questions, yes or no type questions, true or false and fill up the blanks and direct one word answer.

Table 2.
Knowledge Items Identified for Groundnut Crop

Sl. No.	Selected questions	Knowledge items for groundnut (included in the interview schedule)
1	2*	What is the blanket recommendation of nutrient for Groundnut _____
2	3*	At how many days after sowing, two hand weedings and hoeing are necessary to control weeds if no herbicide is applied
3	8*	After application of which nutrient earthing up should be done _____ a.Gypsum b. Water c. Zinc sulphate d. none
4	9*	Which nutrient should be applied in the soil which is deficient in calcium and sulphur?
5	12*	What is the recommended spacing for groundnut? _____
6	24*	How many days after sowing, life irrigation is needed?
7	26*	What is the important cultural operation to be carried out to provide medium for the peg development?
8	29*	Appearance of pustules on the lower surface of leaf is the symptom of _____ a.Leaf spot b. rust c. early leaf spot d. none of the above
9	38*	What are the recommended management practices to overcome the problems of termite in groundnut field?
10	52*	What is the quantity of gypsum to be applied _____?
11	53*	Do you agree that, seed treatment is to be done to overcome the problem of stem rot?

CONCLUSION

The scale constructed following standard procedures may be used by the researchers for similar studies. The scale constructed will save the time of researchers working on similar lines.

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