



## CONSTRUCTION OF KNOWLEDGE TEST TO MEASURE THE KNOWLEDGE LEVEL OF RICE FARMERS

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### ABSTRACT

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The knowledge test was developed to measure the knowledge of Rice farmers in Chittoor district of Andhra Pradesh. Relevant items covering all aspects of Rice cultivation were collected from literature available and in consultation with scientists of Regional Agricultural Research Station (RARS), Tirupati. After getting jury opinion on the items of test, index of item difficulty, index of item discrimination and index of item validity were worked out. To administer the knowledge test a respondent was given one mark for each correct answer and zero mark for each wrong answer. The total score of the respondents on all items of the test was taken on the basis of their knowledge score and the respondents were categorized into three groups having low, medium and high knowledge about recommended package of practices of Rice.

**KEYWORDS:** Knowledge, reliability, validity, point biserial correlation, item difficulty index, item discrimination.

### Prologue:

Acharya Ranga Krishi Vigyan Kendra (RASS - ARKVK) was established in 1992 in Chittoor district of Andhra Pradesh. Rice is one of the major crops in the district cultivated under tanks and bore wells during both *kharif* and *rabi* seasons. RASS - ARKVK has been continuously sensitizing the farmers for the past two decades on location specific, technically and economically feasible technologies that improve the productivity of the Rice through various extension efforts like training programmes, front line demonstrations, field days, exposure visits mass media etc. To bring improvement in the cognitive domain of the Rice farmers behaviour it is essential to know about their existing knowledge levels on the recommended package of practices. For adoption of recommended improved technologies it is prerequisite on the part of adopters that they possess good knowledge about these technologies and practices.

Knowledge is defined as “those behaviours and test situations which emphasizes the remembering either by recognition or by recall of ideas and materials on some phenomenon” (Bloom, 1956).

Knowledge for the present study was operationally defined as the quantum of technical information possessed

by the respondents about improved cultivation practices recommended for Rice.

The main intention of the knowledge test was to identify the extent of knowledge of beneficiaries as well as non- beneficiaries of KVK on Rice production technologies. Hence a test was constructed for testing knowledge in Rice. The following steps were followed for standardizing the knowledge test.

### METHODOLOGY

#### Collection of knowledge items

The content of the test was composed of items asked in the form of questions. The important factor considered in collecting the items for knowledge test was to determine and classify the object to be measured by it by taking of the respondent's abilities. For this test, a comprehensive list of 48 knowledge questions on recommended production technologies of Rice crop were collected from pertinent literature, discussions held with the experts of Regional Agricultural research Station & S.V. Agricultural College, Tirupati, feedback from progressive farmers and personal experiences.

#### Selection of items

The selection of the items was done based on the following criteria.

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i) Response to item should promote thinking rather than rote memorization.

ii) They should differentiate the well informed respondent from the less informed and should have certain difficulty value.

iii) The items included should cover all areas of knowledge about Rice production technologies.

The items were edited and drafted in such a way that each item highlighted only one idea and did not have any ambiguity.

### Form of questions

The items selected for construction of knowledge test were framed into multiple choice questions, fill in the blanks and true / false type questions. The particulars on the form of questions were furnished below.

### Pre-testing

Pre-testing of the items was done as suggested by Conard (1948). The items selected for the Knowledge test were pre-tested separately by administering the items to 30 respondents. Care was taken to see that these 30 respondents were outside the main sample of the study.

### Item analysis

The item analysis was carried out so as to yield two kinds of information *viz.*, index of 'Item difficulty', index of 'Item discrimination' and index of 'Item validity'. The index of item discrimination provided information on how well an item measures or discriminates in agreement with the rest of the test, while the index of 'Item difficulty' indicates the extent to which an item was difficult. The index of 'Item validity' provided the information on how well an item measured or discriminated in agreement with rest of the test. The function of the item discrimination index was to find out whether an item really discriminates a well informed respondent from poorly informed respondent.

### Item analysis for Rice

The 48 items were administered to 30 respondents who were not included in sample but they were included in pre-testing. The data thus obtained was subjected for typical item analysis. To analyze 48 items each one of the 30 respondents to whom the test items administered was scored on the basis of the score allotted, 'one' for

correct response and 'Zero' for incorrect response. After computing the total score obtained for each of the 30 respondents on 48 items, they were arranged in order from highest to lowest. These 30 respondents were then divided into six equal groups, arranged in descending order of total scores obtained by them. These groups were labeled as G1, G2, G3, G4, G5 and G6 respectively with five 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 data of correct responses for each of the 48 items were tabulated for each of these four groups.

### Item difficulty index (P)

The index of item difficulty was worked out as the percentage of the respondents answering on items correctly. The assumption in this item index of difficulty was that the difficulty is linearly related to the level of respondents' knowledge about Rice production practices. When a respondent answered an item, it was assured that the item was less difficult than his ability to cope with it. In this study with this assumption, the items with P values ranging from 30 to 70 were considered for final selection of knowledge items. It was calculated by following formula:

$$P = \frac{\text{No. of respondents answered correctly}}{\text{Total No. of respondents}}$$

### Item discrimination index ( $E^{1/3}$ )

The second criterion for item selection was the item discrimination index indicted by " $E^{1/3}$ " which is calculated by the formula.

$$E^{1/3} = \frac{(S_1+S_2) - (S_5+S_6)}{N/3}$$

where  $S_1$ ,  $S_2$  and  $S_5$ ,  $S_6$  are the frequencies of correct answers in the groups  $G_1$ ,  $G_2$  and  $G_3$  and  $G_6$  respectively. 'N' is the total number of respondents in the sample selected for the item analysis *i.e.*, 30.

The items with discrimination index 0.30 to 0.70 were selected for the final test since the discrimination index varies from 0 to 1 was considered necessary to select items with atleast 0.30 discrimination index as the lowest and 0.70 as the highest discrimination index point in order to have wider continuum for the discrimination index. The values of the discrimination index for the knowledge items on recommended production technologies for Rice are presented.

**Point biserial correlation ( $r_{pb}$ )**

The main aim of calculating point biserial correlation 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. In a way, the validity power of the item was computed by correlation of the individual item of the whole test. The point biserial correlation for each of the item of preliminary knowledge test calculated by using the formula suggested by Garrett (1966).

$$r_{pb} = \frac{MP - MQ}{SD} \times \sqrt{pq}$$

where,

$r_{pb}$  = point biserial correlation

MP = Mean of the total scores of the respondents who answered the item correctly

(or)

$$MP = \frac{\text{Sum total of } xy}{\text{Total number of correct answers}}$$

MQ = Mean of the total scores of the respondents who answered the item incorrectly

(or)

$$MQ = \frac{\text{Sum total of } x - \text{Sum total of } y}{\text{Total number of wrong answers}}$$

SD = Standard deviation of the entire sample

P = Proportion of the respondents giving correct answer to the item (or)

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

Q = Proportion of the respondents giving incorrect answer to the item (or)

$$Q = 1 - P$$

X = Total score of the respondent for all items

Y = Response of the individual for the items (Correct = 1; Incorrect = 0)

XY = Total score of the respondent multiplied by the response of the individual to the item (Correct = 1; Incorrect = 0)

A Point biserial correlation of atleast 0.15 is recommended and it is established that ‘good’ items have point biserial values above 0.25 (Varma, 2007). Hence in this study, items having significant point biserial correlation  $\geq 0.25$  were selected for the final test of the knowledge.

**Representativeness of the test**

Care was taken to see that the test items selected finally covered the entire universe of the relevant behavioural aspects of respondents’ knowledge about recommended production technologies of Rice.

**Total items selected**

Out of the 48 items of the Rice crop, 28 items were finally selected based on

1. Items with difficulty level indices ranging from 30 to 70
2. Items with discrimination indices ranging from 0.30 to 0.70
3. Items having point biserial values  $\geq 0.25$

Thus the finally selected knowledge test items comprised of 3 test items, multiple choice, direct questions and Yes / No types totalling to 28 items test battery on knowledge of production technologies of Rice. The selected items with P,  $E^{1/3}$  and  $r_{pb}$  values are shown below.

The knowledge test for Rice was subjected to reliability as below.

**Reliability of the test**

Test - retest method was used to compute the reliability of the test. The tests were administered to 30 respondents separately with an interval of 15 days. The two sets of knowledge scores obtained by the farmers were correlated. The correlation coefficient ( $r = 0.80$ ) was highly significant indicating a high degree of dependability of the instrument for measuring knowledge of Rice farmers.

**Validity**

The validity of the test items was tested by the method of point biserial correlation ( $r_{pb}$ ). The items with  $\geq 0.25$  values indicated the validity of the items in relation to knowledge test designed to measure the knowledge of production technologies of Rice.

Difficulty and discrimination indices for knowledge test items and point biserial correlations in Rice

Item no.	Frequency of correct answers given for 4 extreme groups (N = 5)						Total frequency correct answers (N=30)	Per cent of giving correct responses	Difficulty index (%) (P)	Discrimination index (E I/3)	Point biserial correlation (r <sub>pb</sub> )	Item selected for the study
	G1	G2	G5	G6	G4	G5						
1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.		
1	4	3	3	1	20	66.67	55	0.3	0.29	v		
2	4	4	2	1	19	63.33	55	0.5	0.40	v		
3	5	5	1	3	22	73.33	70	0.6	0.42	v		
4	4	5	2	2	22	73.33	65	0.5	0.43	v		
5	5	3	3	1	18	60.00	60	0.4	0.30	v		
6	5	4	3	2	20	66.67	70	0.4	0.30	v		
7	5	3	1	1	16	53.33	50	0.6	0.45	v		
8	4	4	3	3	23	76.67	70	0.3	0.22	X		
9	1	4	0	0	5	16.67	25	0.5	0.35	X		
10	5	3	1	3	19	63.33	60	0.4	0.19	X		
11	5	4	2	2	19	63.33	65	0.5	0.44	v		
12	4	1	1	2	12	40.00	40	0.2	0.19	X		
13	3	4	3	2	21	70.00	60	0.2	0.25	X		
14	3	4	3	0	16	53.33	50	0.4	0.27	v		
15	5	5	3	0	20	66.67	65	0.7	0.57	v		
16	5	4	1	4	21	70.00	70	0.4	0.33	v		
17	4	4	3	3	23	76.67	70	0.2	0.20	X		
18	4	3	1	0	14	46.67	40	0.6	0.46	v		
19	3	4	3	1	17	56.67	55	0.3	0.28	v		
20	2	5	0	0	11	36.67	35	0.7	0.45	v		
21	2	3	2	2	14	46.67	45	0.1	0.11	X		
22	4	2	1	2	15	50.00	45	0.3	0.31	v		
23	3	2	2	1	11	36.67	40	0.2	0.00	X		
24	5	2	2	1	17	56.67	50	0.4	0.42	v		
25	3	1	1	1	7	23.33	30	0.2	0.08	X		

Cont...

Item no.	Frequency of correct answers given for 4 extreme groups (N = 5)						Total frequency correct answers (N=30)	Per cent of giving correct responses	Difficulty index (%) (P)	Discrimination index (E I/3)	Point biserial correlation (r <sub>pb</sub> )	Item selected for the study
	G1	G2	G5	G6	G5	G6						
1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.		
26	4	4	1	3	15	50.00	60	0.4	0.22	X		
27	4	3	5	1	19	63.33	65	0.1	0.12	X		
28	4	3	1	3	18	60.00	55	0.3	0.33	v		
29	5	3	1	1	18	60.00	50	0.6	0.54	v		
30	4	4	1	0	13	43.33	45	0.7	0.46	v		
31	3	3	1	1	14	46.67	40	0.4	0.35	v		
32	5	3	1	2	19	63.33	55	0.5	0.40	v		
33	1	1	1	0	8	26.67	15	0.1	0.08	X		
34	3	3	1	2	17	56.67	45	0.3	0.36	v		
35	4	2	2	0	13	43.33	40	0.4	0.32	X		
36	4	5	3	1	14	46.67	65	0.5	0.23	X		
37	4	5	3	0	18	60.00	60	0.6	0.49	v		
38	2	3	1	0	12	40.00	30	0.4	0.38	v		
39	4	3	3	2	17	56.67	60	0.2	0.05	X		
40	1	0	1	1	8	26.67	15	-0.1	-0.14	X		
41	3	2	1	0	9	50.00	30	0.4	0.36	v		
42	1	3	1	2	14	46.67	35	0.1	0.15	X		
43	4	4	1	3	15	50.00	60	0.4	0.16	X		
44	4	4	5	2	22	73.33	75	0.4	0.29	v		
45	3	3	2	1	14	46.67	45	0.4	0.34	v		
46	4	4	2	2	15	50.00	60	0.4	0.17	X		
47	3	4	1	1	16	53.33	45	0.5	0.39	v		
48	4	2	3	2	16	53.33	55	0.1	0.13	X		

**Criteria for item selection:**

- a) Items having difficulty index values ranging from 30 – 70
- b) Items having discrimination index values ranging from 0.3 – 0.7
- c) Items having point biserial correlation values  $\geq 0.25$

### Content validity

The content validity of the knowledge test was derived from a long list of test items represented the whole universe of production technologies of Rice crop, collected from various sources as discussed earlier. It was assumed that the score obtained by administering the knowledge test of the study measures what was intended to measure.

Thus the knowledge test developed in the present study measures the knowledge of the farmers of both adopted and non-adopted villages of KVK on Rice production technologies and it showed a greater degree of reliability and validity indicating that the test items were valid.

### Scoring pattern

The 28 selected knowledge test items of Rice were arranged under different types as multiple choice, fill up the blanks and yes/no type. The correct response to each test was scored 'one' and incorrect response a score of 'zero'. that the knowledge score of a respondent is the summation of correctly answered items out of total of 28 items. The possible knowledge score for Rice test ranges from 0 to 28.

### Administration of the test

The entire interview schedule was prepared in Telugu language and it made the job of investigator very easy and enabled him to ask exactly what was intended to do so. Each item in the knowledge test of Rice was read out to the respondents in Telugu by the investigator and the responses in the form of correct or incorrect answer were recorded. The correct answer was assigned a weightage of 'one' and 'zero' to incorrect.

### Categorization

The mean and standard deviation of all the respondents' scores were computed for classifying the knowledge level in different categories. Based on the knowledge scores obtained the farmers were grouped into three categories by using mean and standard deviation.

### Categories

1. Low knowledge — Less than (Mean - SD)
2. Medium knowledge — From (Mean  $\pm$  SD)
3. High Knowledge — Above (Mean + SD )

### Epilogue:

The test so developed could be used for assessing the knowledge levels of Rice farmers. Based on the knowledge levels of the farmers, the programmes may be modified accordingly to perk up the knowledge levels of the farmers.

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