

Construction and Standardization of Knowledge Test to Measure the Knowledge Level of Farmers on SRI Technology

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ABSTRACT

The knowledge test was developed to measure the knowledge level of Rice Farmers about System of Rice Intensification (SRI) Technology in Nagapattinam District of Tamil Nadu. Pertinent items were collected covering all aspects of SRI production technology. After getting jury opinion on the items of test item, the item analysis, difficulty index, index of item discrimination and index of item validity were worked out. To administer the knowledge test a score of one was given for each correct answer and zero was given for 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 levels about System of Rice Intensification (SRI) Technology.

Key words: Standard Scale, Knowledge, Rice, SRI technology,

India is one of the largest producers of Rice in the world; however, Rice cultivation in recent times has suffered from several interrelated problems. Increased yields achieved during the green revolution through input intensive methods of high water and fertilizer use in well-endowed regions are showing signs of stagnation and concomitant environmental problems due to salinization and water-logging of fields (the grain bowls of India Punjab and Haryana are some of the areas worst affected). In other parts there have been social conflicts between water users in several canal-irrigated areas due to the water intensive nature of the crop. In the meantime in Tamil Nadu farmers started to adopt System of Rice Intensification (SRI) by changing the conventional technologies. The System of Rice Intensification (SRI) is a method of increasing the yield of rice produced in farming. The System of Rice Intensification, or SRI, is a system that has evolved over the last few decades of the 20th century and offers a radical departure in the way of growing more rice with fewer inputs. The main intention of the knowledge test was to identify the knowledge level of SRI farmers about

recommended practices. The details of the standardization of the items are as follows.

METHODOLOGY

Considering the importance of SRI technology a knowledge test was developed by employing the following methodology and standardization of test items was made as given below.

Collection of Knowledge Items: The content of the test was composed of items asked in the form of questions. The important factor considered for collecting the items for knowledge test was to determine and classify the object to be measured by taking care of the respondents' abilities. Items were collected from different sources like printed literature on package of practices, recommendations of Tamil Nadu Agricultural University, package of practices and recommendations of State Department of Agriculture, Tamil Nadu.

Selection of Items for Item Analysis : The criteria used for selection of items were,

- i. Response to items should promote thinking rather than memorization.

- ii. They should differentiate the well-informed respondents from the less informed and should have certain difficulty value.
- iii. The items included should cover all areas of knowledge about recommended package of practices of System of Rice Intensification.

By respecting above criteria, 62 items were selected for developing knowledge test after editing carefully. The items were then framed into objective form questions and in this form, the answers were completely controlled by having true/ false, multiple choice and fill in the blanks and therefore the assessment was objective and impersonal.

Item Analysis: The item analysis was carried out to yield two kinds of information viz., indices of 'Item Difficulty' and 'Item Discrimination'. The index of item difficulty indicates the extent to which an item was difficult. The latter provides information on how well an item measures or discriminates a well-informed respondent from poorly informed respondent.

Pre-testing : Pre-testing of the items was done as suggested by Gonard (1948) by administering the questions to 60 SRI farmers in non- sample area of Vedaranyam block of Nagapattinam district and Aduthurai of Thanjavur district. All the 62 items were administered to each one of the 60 respondents. The scores allotted were '1' for correct response and '0' for incorrect response. After computing total scores obtained by each of the 60 respondents on 62 items, they were arranged in the descending order. Then the respondents were divided into six equal groups of ten members each and were labeled as G1, G2, G3, G4, G5 and G6. 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.

Selection of the Items for the Final Test : Selection of the items for final knowledge test was done based on the following criteria.

Item Difficulty Index (P) : The item difficulty index was worked out as the percentage of the respondents answering an item correctly. The assumption of the item statistic of difficulty index was that, the difficulty is linearly related to the level of respondent's knowledge about recommended package of practices of SRI. The items with 'P' values ranging from 20 to 80 were considered for the final selection of the knowledge test battery.

Discrimination Index (E 1/3) : The item discrimination index (E 1/3), which indicates the level of discrimination between well informed and poorly informed respondents, was computed formula given below.

$$E \frac{1}{3} = \frac{(S1 + S2) - (S5 + S6)}{N/3}$$

where,

S1, S2, S5 and S6: Frequencies of correct answers in the groups G1, G2, G3 and G4.

N: Total number of respondents of the sample selected for the item analysis

The value of discrimination index ranges from 0 to 1. The items with Discrimination Index ranging from 0.20 to 0.80 were selected for the final test.

Point Biserial Correlation (rpbis) : 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 the correlation of the individual item of preliminary knowledge test calculated by using the formula suggested by Garret (1966).

$$r_{pbis} = \frac{MP - MQ}{SD} \times \sqrt{PQ}$$

Where,

rpbis = Point biserial correlation

MP = Mean of the total scores of the respondents who answered the items correctly (or)

$$MP = \frac{\text{Sum of total of } xy}{\text{Total No. of correct answers}}$$

MQ = Mean of the total scores of the respondents who answered the items incorrectly (or)

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

SD = Standard deviation of the entire sample (60 nos.)

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 specific items
(Correct = 1, Incorrect = 0)

These 'r' values of the items were further subjected to the 't' test.

XY = Total score of the respondent multiplied by the response of the individual to the item.

Items having significant point biserial correlation, either at 1 per cent or 5 per cent level were selected for the final test of the knowledge (Table 1.)

Test of significance of rpbis: To test the significance of point biserial correlation co- efficiencies the following 't' (t-test) formula was used.

$$t = \frac{r_{pbis} \sqrt{N-2}}{\sqrt{1-r_{pbis}^2}}$$

where,

rpbis = Point biserial correlation

N = Total number of respondents of the sample selected for the item analysis

Total Items Selected : Out of 62 items 33 items were finally selected based on the following criteria.

1. Items with difficulty level indices ranging from 20 to 80.
2. Items with discrimination indices ranging from 0.20 to 0.80.
3. Items having significant 't' value either at 1 per cent or 5 per cent level.

All important components of the recommendations have been covered. The questions were prepared in such a way that no important component has been left out. If any important question is left by failing to pass the above said criteria, can also be included in order to cover all the components.

The finally selected knowledge test items comprised of four types of questions viz., Multiple choice (12 Nos.) True or False (10 Nos.) Yes or No (5 Nos.) and Fill in the blanks (6 Nos.) totaling to 33 items of test battery on knowledge of recommended package of practices of System of Rice Intensification.

Reliability of the Test : Reliability of the items was tested by split half method. The scores obtained by odd numbers of respondents were taken as one set of values and the scores of even numbers of respondents as the

second set of values for calculating the correlation coefficient. The correlation co-efficient ($r=0.73$) was highly significant indicating a high degree of dependability of the instrument for measuring knowledge of the farmers.

Validity of the test : The content validity of the knowledge test was derived from a long list of test items representing the whole universe of recommended package of practices of SRI collected from various sources as discussed earlier and includes materials from literature, experts opinion, findings of past work and discussions with extension workers, officials of the Department of Agriculture and progressive farmers. 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 in the present study measures the knowledge about recommended practices of System of Rice Intensification farmers as it showed a greater degree of reliability and validity.

Practicability of the test and Scoring pattern : The selected knowledge test items included four types as true or false, multiple choices, yes or no and fill in the blanks. The correct response to each test item was given a score of '1' and incorrect response a score of '0' that the knowledge score of a respondent is the summation of scores of correctly answered items out of total test items. The possible knowledge score ranged from 0 to 33. The total score of correct answers given by a individual respondent will be the knowledge of that particular respondent. Later the respondents will be categorized into different groups (low, medium and high) based on the mean and standard deviation.

Administration of the Test : Each item in the knowledge test was read out to the respondents in translated version (Tamil) by the investigator and the responses in the form of correct or incorrect answers were recorded.

CONCLUSION

Knowledge test to measure the knowledge of SRI farmers acts as a pivotal factor in enhancing rice production. There are tests available for measuring knowledge, but, since agriculture being a state subject, location specificity of crops and technologies of cultivation demands separate tests for measuring knowledge. Hence the attempt to develop knowledge

test emerged with standard measuring instrument. The stability of the instrument was measured with the help of calculating reliability and validity of the measurement. Split half reliability method was used to find out the reliability. The correlation ($r=0.73$) was highly significant indicating a high degree of dependability of the test for measuring the knowledge of SRI farmers. The validity of the test items was tested by the method of point biserial correlation (rpbis). The items with high significant correlation coefficients either at 1 or 5 per cent level were included in the standard knowledge test designed to measure the knowledge of production recommendations of SRI technology. The instrument consists of 33 items in the knowledge test which can be administered to the respondents. The correct response will be assigned a score of 1 and a score of 0 was assigned to incorrect response. The total score of correct answers given by an individual respondent will be the knowledge of that particular respondent. Thereafter, the respondents will be categorized into different groups (low, medium and high) based on the mean and standard deviation.

Table 1. Difficulty, Discrimination, Point biserial correlation and t values for Knowledge test items

G1	G2	G5	G6	DI	E	PBC	't' values
7	10	3	7	65	0.35	0.1195	0.9164 ^{NS}
9	9	3	4	62	0.55	0.2551	2.0096*
6	4	6	3	43	0.05	0.0784	0.5993 ^{NS}
7	6	7	5	68	0.05	0.0624	0.4769 ^{NS}
8	2	1	0	23	0.45	0.2563	2.0197*
10	10	9	5	88	0.3	0.3638	2.9745**
7	8	2	1	35	0.6	0.2512	1.9765*
10	10	3	2	40	0.45	0.2244	1.7536 ^{NS}
10	10	9	8	95	0.15	0.2994	2.3899*
9	2	1	1	27	0.45	0.2739	2.16947*
8	6	1	1	32	0.6	0.2779	2.2040*
8	5	2	0	28	0.55	0.2790	2.2130*
8	8	2	1	48	0.65	0.2908	2.3152*
7	9	4	5	67	0.35	0.1843	1.4282 ^{NS}
10	8	0	0	35	0.9	0.4061	3.3849**
8	5	0	0	28	0.65	0.3288	2.6521**
10	10	9	8	92	0.15	0.2159	1.6843 ^{NS}
9	9	3	2	58	0.65	0.3189	2.5633*
8	7	2	2	38	0.55	0.2662	2.10313*
8	0	0	0	35	0.4	0.2458	1.9316 ^{NS}
10	10	1	0	60	0.95	0.4701	4.0559**

10	10	8	4	85	0.4	0.3762	3.0922**
9	10	9	8	92	0.1	0.0798	0.6101 ^{NS}
9	9	0	0	52	0.9	0.4109	3.4327*
8	7	2	1	38	0.6	0.2658	2.0996*
7	10	5	4	72	0.4	0.2337	1.8306 ^{NS}
5	0	0	0	17	0.25	0.2316	1.8133 ^{NS}
10	10	6	4	82	0.5	0.3455	2.8045**
9	9	0	0	40	0.9	0.3698	3.0318**
10	7	2	0	58	0.75	0.4008	3.3325**
7	7	0	0	32	0.7	0.3248	2.6156*
10	8	7	8	82	0.15	0.1665	1.2858 ^{NS}
8	10	4	5	67	0.45	0.2004	1.5582 ^{NS}
7	7	9	6	72	-0.05	-0.0013	-0.0104 ^{NS}
10	9	4	6	62	0.45	0.1952	1.5156 ^{NS}
4	8	8	6	68	-0.1	-0.0909	-0.6958 ^{NS}
10	10	8	6	87	0.3	0.2863	2.2760*
8	8	7	2	65	0.35	0.1841	1.4269 ^{NS}
8	7	1	2	57	0.6	0.2881	2.2911*
10	10	8	6	88	0.3	0.3121	2.5018*
8	8	6	4	68	0.3	0.1151	0.8826 ^{NS}
9	10	0	0	45	0.95	0.4189	3.5131**
10	9	4	7	72	0.4	0.2195	1.7139 ^{NS}
6	5	6	2	53	0.15	0.0697	0.5325 ^{NS}
5	2	1	0	22	0.3	0.1384	1.0644 ^{NS}
8	5	9	9	78	-0.25	-0.1031	-0.7896 ^{NS}
10	9	8	5	85	0.3	0.3081	2.4663*
10	8	6	6	75	0.3	0.1706	1.3188 ^{NS}
9	5	8	8	73	-0.1	0.0175	0.1337 ^{NS}
10	10	8	5	83	0.35	0.3310	2.6718*
10	10	10	10	92	0	-0.0363	-0.2768 ^{NS}
6	6	1	1	33	0.5	0.25082	1.9732 ^{NS}
8	2	3	0	32	0.35	0.2033	1.5817 ^{NS}
8	2	0	0	23	0.5	0.2546	2.0051*
3	1	1	2	20	0.05	0.0677	0.5165 ^{NS}
6	3	2	0	27	0.35	0.1775	1.3739 ^{NS}
5	4	1	1	27	0.35	0.1960	1.5225 ^{NS}
10	10	10	8	97	0.1	0.2851	2.2651*
10	10	9	7	92	0.2	0.2935	2.3384*
8	5	2	0	48	0.55	0.3169	2.5451*
8	10	9	10	88	-0.05	-0.0685	-0.5227 ^{NS}

** = Significant at 1% level

* = Significant at 5% level

NS = Non- Significant

DI = Difficulty Index

E = Discrimination Index (E1/3)

PBC = Point biserial correlation (rpbis)

G1, G2, G5, G6 = Frequencies of correct answers in four extreme groups

Knowledge test item: The following statements are developed for conduct of pre-test for selecting the final statements for the knowledge test. Please indicate the most appropriate answer from the alternatives given under each of the following statements.

1. Suitable season is
 - a) Dry season with assured irrigation.
 - b) rainy season
 - c) hot summer
2. The recommended seed rate/ha for SRI is
 - a) 7-8 kg
 - b) 60-70 kg
 - c) 40-50 kg
3. Recommended varieties
 - a) Hybrids and varieties with heavy tillering
 - b) varieties
 - c) any variety
4. The type of nursery followed in SRI is
 - a) Wet nursery
 - b) Bed nursery
 - c) Mat nursery
5. SRI can be very successful with
 - a) Hybrids
 - b) varieties
 - c) traditional seeds
6. Time of gap filling
 - a) Between 7th & 10th DAT
 - b) Two weeks later
 - c) One week later
7. No. of the seedling(s) is/are to be transplanted under the SRI method
 - a) one
 - b) 2-3
 - c) 4-5
8. Type of planting followed under the SRI method
 - a) triangle
 - b) square
 - c) round
9. Indicator for irrigation
 - a) presence of hairline cracks
 - b) wilting of plants
 - c) lodged crops
10. Irrigation level to be maintained till panicle initiation stage is
 - a) 5.0cm
 - b) No standing water
 - c) 15 cm

11. Land leveling is important for
 - a) uniform distribution of water
 - b) easy walking
 - c) Easy harvesting
12. Time for first cono weeding is
 - a) 30 DAT
 - b) 10-15 DAT
 - c) 60 DAT
13. Manual weeding is also essential to
 - a) remove the weeds closer to rice root zone
 - b) soil aeration ,
 - c) both a & b
14. Which one of the following is related to fertilizer application
 - a) Leaf colour chart
 - b) Physical appearance of the crop
 - c) both a&b
15. LCC is related to which nutrient?
 - a) Nitrogen
 - b) Phosphorous
 - c) Potassium
16. The soil type suitable for SRI is
 - a) sandy soil
 - b) loamy clay
 - c) red soil
17. Nursery can be raised on
 - a) banana sheath
 - b) raised bed/ trays
 - c) all the above

Please consider the following statements indicate whether True or False True False

18. SRI method optimizes the water usage
19. There should be ponded water condition always
20. Green manure and farm yard manure application will enhance the growth and yield of rice in this system approach.
21. Paddy transplanter cannot be used for SRI method
22. Planting the single seedlin will produce more than 50 tillers
23. Conoweeder has to be used on forward and rear as well as rows and columns.
24. Hybrids are not recommended for SRI.
25. Conoweeder usage advantages the soil aeration.
26. Incorporation of the weeds enhances the soil fertility.
27. Wider spacing reduces the incidence of BPH
28. With SRI method seed requirement can be very much reduced

- alkali soils
30. Mechanized cono weeders are also available to reduce the drudgery.
 31. If seedling growth is slow fertilizer can be applied.
 32. Seedlings should be pulled from nursery bed along with seed and soil to avoid transplanting shock
 33. Tillering is more in SRI is due to planting with young seedlings
- Please consider the following statements indicate whether Yes or No Yes No
34. Due more length of panicle and number of grains per panicle in SRI we get more yield
 35. SRI is highly suitable for water limited area
 36. Incorporation of weeds by cono weeder enhances the soil fertility
 37. SRI yields more than conventional method
 38. Pest and disease incidence is lower than traditional method of cultivation
 39. Labour requirement is more for transplanting in SRI
 40. Labour requirement is more for weeding in SRI
 41. SRI minimizes the cost of cultivation
 42. Irrigation water requirement is less than traditional method
 43. Organic manure requirement is more in SRI
 44. Duration of crop is reduced in SRI method
 45. Performance of crop under SRI is variety neutral
 46. Straw production is more under SRI
 47. Do you know that Department of Agriculture is providing cono weeders and Markers on subside
 48. Usage of weedicides is recommended in SRI
 49. Time of using LCC is _____ for SRI transplanted rice.
 50. Time of using LCC is _____ for direct seeded rice.
 51. The spacing followed in SRI between plant to plant and row to row is _____.
 52. N dose as per the LCC to be applied is _____ kg/ha for dry season.
 53. The price of weeding implements is _____.
 54. N dose as per the LCC to be applied is _____ kg/ha for wet season.
 55. In SRI the Leaf Colour Chart (LCC) is compared with _____ leaf.
 56. In the absence of spacing marker _____ can be used.
 57. SRI is not recommended in summer _____.
 58. Implement used for weeding is _____.
 59. Pulled out seedlings should be planted within _____ minutes.
 60. Nursery Area required for taking up SRI in one acre _____.
 61. Age of the seedling to be transplanted _____.
 62. The season suitable for SRI is _____.

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