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Short Note

Developing a Test to Measure the Knowledge of Stakeholders on Eco-friendly Rice Farming

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Rice wetland eco-system being highly fragile, the adverse effects of input intensive farming is prominent and far-reaching. It is very important in today's context to assess the knowledge level of stakeholders in eco-friendly rice farming, as this is integral in the adoption of such practices in rice. Hence a study was designed to develop a test and standardize it to measure the knowledge of stakeholders in eco-friendly rice farming. Item analysis comprising of difficulty index and discrimination index was employed in the test construction and the final test comprising of 15 items, with difficulty index value in the range of 10-75 and discrimination index ranging from 0.20 to 0.90 was standardized for administration.

Key words: Eco-friendly rice farming, Item analysis, Difficulty index, Discrimination index, Validity.

Rice continues to shape the lives of 3 billion people of this planet and hence 'Rice is Life'. Rice wetland ecosystem is very important in maintaining ecological balance. The crop can be grown under diverse ecological conditions and has a very prominent role in maintaining the microclimate of the area. They have an imminent role in conserving water, stabilizing ground water table and preventing floods. Moreover, rice fields provide shelter to diverse flora and fauna. Rice area in India increased from 30.81m ha in 1950-51 to 45.35 m ha in 2008-09, while the production has scaled greater heights from 20.58 mt to 99.15 mt during the same period. (Department of Agriculture and Co-operation, 2009). This increase may be attributed to green revolution, which was a milestone in the agrarian history.

Despite green revolution contributed significantly in increasing production and productivity in the initial years, the adverse effects visibly stands out as deterioration of soil quality, environmental pollution due to over use of inorganic inputs, loss of biodiversity and genetic erosion. Rice wetland eco-system being highly fragile, the adverse effects of input intensive farming is prominent and far-reaching. The knowledge of the stakeholders in eco-friendly rice farming is very important as far as the future of sustainable rice farming is concerned. Hence there is an urgent need for developing a test that would help in quantifying the knowledge of stakeholders especially farmers and labourers on eco-friendly rice farming.

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Knowledge test in the study was measured using a teacher made test as suggested by Anastasi (1961). The present study was undertaken with the following objectives:

1. To develop a test to assess the knowledge level of stakeholders viz. farmers, labourers and social activists/environmentalists on eco-friendly rice farming.
2. To standardize the test constructed to assess the knowledge level of stakeholders viz. farmers, labourers and social activists/ environmentalists on eco-friendly rice farming.

Methodology

A standardized knowledge test was developed for measuring the knowledge of farmers and agricultural labourers about eco-friendly practices in rice cultivation by following the procedures presented below. The content of knowledge test was composed of questions called 'items'. A pool of questions was prepared by reviewing pertinent literature and discussing with experts in the respective fields. Finally, a thorough scrutiny of the item pool was made with the assistance of experts to find out items which were supposed to differentiate the well informed respondent from the poorly informed ones and having a certain level of difficulty. A total of 61 items covering the four dimensions of eco-friendly rice cultivation viz. land and soil management, water management, biodiversity and plant protection were selected.

The 61 questions on eco-friendly practices in rice cultivation were administered to 24 randomly selected non-sample respondents prior to the preparation of the final schedule. Item analysis was performed for the statements selected and its validity was also tested. Item analysis yields two kinds of information, item difficulty and item discrimination. The index of item difficulty reveals how difficult an item is, whereas the index of discrimination indicates the extent to which an item discriminates the well-informed individuals from the poorly informed ones.

Scores of value '1' and '0' were given to the correct and incorrect responses, respectively. The scores obtained by the twenty-four respondents were arranged in the descending order of total scores, from the highest to the lowest and the respondents were divided into three groups arranged in descending order of total scores obtained by them. The three groups were G1, G2 and G3. For item analysis, the middle group (G2) was eliminated retaining only the terminal ones with high and low scores (G1, and G3).

The data pertaining to correct responses for all the items in respect of these two groups (G1, and G3) were tabulated and the difficulty and discrimination indices were calculated.

Index of item difficulty,

$$P = \frac{N_p}{N}$$

Where, Np indicates the number of test takers in the total group who pass the item

N indicates the total number of test takers in the group

Index of discrimination, $E^{1/3} = \frac{(S)-(S)}{3}$

Where, S_1 and S_3 are the frequencies of correct answers in the groups G_1 and G_3 respectively.

N = Total number of respondents in the sample

The knowledge test developed was standardized by analyzing its content validity. Content validity is a kind of validity by assumption as described by Guilford (1971).

Results and Discussion

The results of the study have been presented in this section under the subheads viz. item difficulty index (P value), item discrimination index ($E^{1/3}$) of the items, validity and administration of the test.

Table 1. Difficulty and discrimination indices of the knowledge test on eco-friendly practices in rice cultivation

Sl.No.	Questions	Difficulty index	Discrimination index
1.	Name an organic manure used in rice fields	25	0.00
2.	What is the quantity of organic manure that has to be applied in rice fields (in hectare/acre/cents)?	2	0.17
3.	What do we apply to the soil when it is acidic?	24	0.17
4.	What is the quantity of lime that has to be applied to a hectare/acre/cent?	8	0.83
5.	When do we apply lime in rice fields?	5	0.00
6.	Give the name of a bio-fertilizer commonly used in rice	8	0.66
7.	What should be done to the crop residue after harvest? *	17	0.67
8.	What is the minimum time gap after incorporating organic manure and before transplanting rice seedlings? *	15	0.67
9.	Name one green-leaf manure used in rice cultivation	25	0.00
10.	Name a crop, when grown in rice fields adds to the soil fertility?*	21	0.50
11.	How can we determine the fertilizer/nutrient requirement of the crop?	2	0.17
12.	When do we apply *Azolla* in rice fields?	5	0.67
13.	What is the recommended quantity of *Azolla* to be applied in rice fields?	0	0.00
14.	How can we apply nitrogenous fertilizers without adversely affecting the soil health and reducing environmental pollution?	25	0.00
15.	Which is a more eco-friendly practice of fertilizer application, applying fertilizers retaining water in the field or applying it by draining the field?	23	0.17
16.	What is the major benefit of using traditional varieties of rice?	25	0.00
17.	Mention any one natural enemy of insect-pests commonly seen in rice fields*	22	0.33
18.	Name one traditional variety grown in Palakkad district	25	0.00
19.	Which is the major natural enemy of rodent population in rice fields?	25	0.00
20.	Which is the rice variety having medicinal properties?	13	1.00
21.	Name a scented variety of rice grown in Kerala?	22	0.17

22.	What is the use of summer ploughing in rice fields? *	22	0.33
23.	What is the level of water to be maintained in rice fields for better crop stand?	14	1.00
24.	How can we reduce water loss from the channels in rice fields?	9	0.83
25.	Name any cover crop that can be grown in rice fields	23	0.17
26.	Name one of the mulches commonly used in rice fields?	7	0.33
27.	What is the major benefit of applying mulches and growing cover crops in rice?	7	0.83
28.	Why do we expose the rice field to sun after deep ploughing? *	20	0.33
29.	Why do we plaster and trim the bunds in the rice fields? *	11	0.66
30.	Mention any one trap used to control insect-pests of rice*	12	0.83
31.	What is the purpose of using tape or polythene sheets in rice fields?	25	0.00
32.	What are Tricho cards? *	11	0.83
33.	When should be the parasitoids (*Trichogramma*) released in rice fields?	3	0.5
34.	What should be the frequency of the release of parasitoids (*Trichogramma*)?	1	0.00
35.	How many Tricho cards or pieces are to be placed in an acre of rice fields?	2	0.33
36.	Name a microbial formulation effective against many diseases in rice	10	1.0
37.	Which is the insect-pest against which kerosenised roping and field drainage is an effective practice? *	17	0.50
38.	What are the major constituents of *panchagavya*?	9	1.00
39.	How can we treat rice seeds without using chemicals?	9	0.16
40.	What are the benefits of puddling in rice fields?	3	0.50
41.	How are fish beneficial to rice crop?	5	0.50
42.	How can we apply *Pseudomonas fluorescens*?	12	1.00
43.	How can we control the rodent population in rice fields without using chemicals?	23	0.17
44.	Which insect-pests can be controlled by brushing or sweeping rice plants using branched bamboo thorns/leaves of *Parakom*?	23	0.17
45.	Name an effective botanical anti-feedant used against storage pests of rice*	21	0.67
46.	Name one insect-pest that can be controlled by proper water management? *	16	0.83
47.	Why should we harvest rice crop nearest to soil?	3	0.50
48.	What is the purpose of spraying supernatant of cow dung slurry?	7	0.83
49.	Name an insect-pest that can be controlled by adjusting the time of planting	5	0.67
50.	What is soil solarization?	1	0.17
51.	Name a botanical pesticide effectively used in rice? *	18	0.67
52.	What is vermicompost?	25	0.00
53.	What is enriched Farm Yard Manure?	2	0.33
54.	What is the benefit of synchronized sowing in rice? *	22	0.33
55.	What are effective microorganisms?	5	0.83
56.	What is the purpose of applying fish-amino acid?	7	0.67
57.	What is SRI?	25	0.00
58.	What is the major benefit of practicing SRI in environment point of view?	9	0.83
59.	How does pheromone trap control insect-pests (stem borers)? *	20	0.50
60.	What is the benefit of walking across rice fields once in a week during the vegetative phase of the crop?	7	0.67
61.	What is the water level to be maintained during transplanting rice seedlings?	23	0.17

Item difficulty index

The difficulty value of an item refers to the proportion or percentage of individuals who answer the item correctly (Guilford, 1971). As Coombs (1950) pointed out, the difficulty of an item varied for different individuals. In the study, the items with P value ranging from 10 to 75 were considered for final inclusion in the knowledge tests. (Table.1)

Item discrimination index

The index of discrimination is the ability of the item on the basis of which the discrimination is made

between superiors and inferiors (Blood and Budd, 1972). It was indicated by $E^{1/3}$. Different researchers indicated different $E^{1/3}$ value ranges for final selection of items. In the study, the items, with $E^{1/3}$ values ranging from 0.20 to 0.90 were considered for the final selection. (Table.1). Thus 15 items satisfying both the above values were finally selected for the test.

Validity

Seltiz *et. al.* (1977) defined validity of a measuring instrument as the extent to which differences in scores reflects true differences among individuals as the characteristics that we seek to measure, rather than random or constant errors. The knowledge tests developed in the study were tested for their content validity.

Content validity is a kind of validity by assumption as described by Guilford (1971). Care was taken to include items covering the entire universe of relevant aspects of knowledge with regard to eco-friendly practices in rice cultivation. Items were collected through various sources such as experts from agricultural universities and relevant literature. Hence it was assumed that the tests could measure the knowledge of the respondents with validity.

Method of scoring

The respondents were asked to indicate their responses to the items in relevant knowledge tests and the correct answers were assigned score '1' and incorrect answers '0'. The total knowledge score for each respondent was calculated by summing up the scores given for each item.

Categorization of respondents

Knowledge levels of respondents on eco-friendly practices in rice cultivation were calculated and the respondents were classified into 'low', 'medium' and 'high' groups based on frequencies in selected categories.

Conclusion

A test comprising of 15 items was developed and standardized here to measure the knowledge of the stakeholders viz. farmers, labourers and social activists/ environmentalists in rice farming. The test developed was found to be valid. The test developed to assess the knowledge in eco-friendly rice farming is not specific for use with any particular category of respondents. The test is not location specific and can be used in any geographical area with slight modification. Other parallel tests could also be derived and standardized from the results of the study. The test developed would help quantify the knowledge level of various categories of stakeholders in rice farming and the data so obtained could be replicated elsewhere to understand the knowledge level of the people, which in turn will help in formulating strategies for creating environmental awareness.

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