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Farmers' Knowledge in Quality Seed Production Needed for Rice-A Test Development

Gottemukkula Bhavani[1*], M. Sreenivasulu[1] and Ravinder Naik[1]

[1]Department of Agricultural Extension, PJTSAU, Hyderabad-500030, India.

Authors' contributions

This work was carried out in collaboration among all authors. Author GB performed the statistical analysis, wrote the protocol and wrote the first draft of the manuscript. Authors MS and RN designed the research study, design and area. All authors read and approved the final manuscript.

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ABSTRACT

Aims: Aim of the study is to develop a Farmers' Knowledge test for the rice seed production farmers in order to assess their knowledge in rice seed production.
Study Design: Expost facto research design was adopted.
Methodology: Sample: Pretesting was done on 100 rice production farmers in central zone of Telangana state using multistage random sampling procedure with identifying the dimension, collection of items followed by item analysis and checking the reliability and validity for precision and consistency of the results. Test was conducted on October 2019.
Results The process of developing and standardizing of knowledge test was started. A Total of 57 statements were framed.
Conclusion: 32 statements were finally retained which has practical applicability in ascertaining the knowledge of farmers towards rice seed production.
Implications: This standardized test tests the knowledge of rice farmers on rice seed production. This test thereby it facilitates to take the right decisions by farmers, Government officials under rice seed production and policy makers. It can be used extensively by future validating the test.

**Corresponding author: E-mail: bhavanig0712@gmail.com;*

Keywords: Knowledge test; rice seed production; item analysis; reliability and validity.

1. INTRODUCTION

Rice is the staple food crop of India. It occupies highest area among the crops grown in the country. It has been observed that farmers in Andhra Pradesh and Telangana states of India have been taking up rice seed production (hybrid) on a large scale [1]. Telangana is the 29th state of India with a population of 39.64 million by 2018 [2] where rice is the predominant crop which occupies 20.00 lakh.ha of area with 66.22 lakh tones of production. Here in this study the area selected for test development is Central Telangana Zone which is next highest zone (next to the north zone) with 3.670 lakh.ha (Karif) and 1.500 lakh.ha (Rabi) of land under rice followed by southern zone with 2.260(Kharif) and 1.190(Rabi). With 8th National Seed Congress held on 27-29th October in 2015, that touched upon the latest challenges of global seed scenario and cutting-edge technologies in the Indian seed industry and future action plan with a theme- "Quality Seed for Farmer's Prosperity" raised the issue of quality seed production [3]. Availably of quality seed at an affordable price is crucial for spread of rice technology in India. Rice seed production is seen as more complex than the seed production for many other hybrid crops [1]. A Seeds are the foundation of agriculture. Technology has modernized much of farmer's day-to-day operations, but without a steady supply of high-quality seed, yields and crop quality would be greatly decreased. 15-20 per cent yield witnessed with quality seed alone. The response of all other input depends on quality of seeds to a large extent. It is estimated that the direct contribution of quality seed alone to the total production is about 15-20% depending upon the crop and it can be further raised up to 45% with efficient management of other inputs [4].

It has taken long stride due to introduction of high yielding varieties and improved production technologies. The paddy-growing farmers can increase production of paddy through the adoption of new varieties with recommended practices. Knowledge on seed production and its adoption presumed to be influenced by social, economic and situational attributes of an individual which will help the extension personnel to approach right type of farmers for stimulating interest and forming positive attitude towards adoption of new varieties of seeds [5].

The objective of the study was to develop and standardize a knowledge test to measure the farmers' knowledge in rice seed production.

Knowledge is defined as "those behavior's and test situations which emphasized the remembering either by recognition or by recall of ideas and material on some phenomena" [6].

Knowledge of a farmer is the known information or possessed information of farmer towards rice seed production. For measuring respondent's knowledge in rice seed production, a knowledge test was developed and standardized.

2. METHODOLOGY

Five stages were defined to be followed in the measurement of the psychological nature of farmers towards seed village programme. These stages are as follows:

1. Collection and Editing of statements; 2. Item analysis; 4. Reliability assessment, and 5. Validity assessment.

2.1 Collection of Knowledge Items

An item pool of knowledge questions on package of practices of rice seed production was prepared by consulting relevant literature (AI & CC, PJTSAU) and Scientists. Several items were obtained from the scientist and subject matter specialist of plant breeding, pathology and entomology and experts in field of rice seed production. Senior officials of Agriculture Department of Telangana state. All the items were carefully screened for their relevancy to the knowledge of rice seed production. Finally, 57 items were selected and subjected to item analysis to screen some more items based on opinion of rice farmers from non-sample areas.

2.1.1 Framing of test items

All the items of the test battery were grouped in three different types of objective questions, namely "true or false", "multiple choice" and "fill in the blanks" looking into the suitability of bits of knowledge.

Selection of items for item analysis was based on the following criteria: 1) Response to item should promote thinking; 2) item should have certain

difficulty value; 3) the test should include all the areas of the knowledge selected for subject.

2.1.2 Pre-testing

The items were pre-tested by administering them to 100 farmers. selected conveniently based on their willingness to participate from central zone of Telangana state and found that only 41 items out of 57 items were applicable to the local situation. The remaining items were discarded.

2.2 Item Analysis

This item analysis was carried out based on main three indices as follows: "Item difficulty index, item discrimination index and point biserial correlation".

Item Difficulty Index: This indicates the extent to which an item was difficult.

Item Discrimination Index: The index of item discrimination provides information on how well an item discriminates in agreement. In other words whether an item really discriminates a well informed respondent from a poorly informed one.

Point Biserial Correlation: This provide information on how well the item measures or discriminates in agreement with the rest of the test.

2.2.1 Item difficulty index

Here each response for multiple choice, fill in the blanks and true or false questions were given a score of one for correct answer and zero for wrong one. After it is computed accordingly for each farmer, they are then arranged in descending order. Then a six-farmer group (FG) was made with all the 60 farmers by divided in six groups called FG1, FG2, FG3, FG4, FG5 and FG6 with 10 farmers in each group. Here, we are retaining only the extreme groups, i.e, two groups from high scores namely FG1, FG2 and two groups from low scores namely FG5, FG6. After getting the four groups the index was worked out in terms of the percentage of respondents answering an item correctly. The usual assumption in this statistic was that the item difficulty was linearly related to the level of respondent's knowledge in rice seed production. The index was computed for 41 items separately by using the following formula:

Difficulty Index (P)= Number of correct answers for i^{th} item/ Total number of farmers x 100

All the items with difficulty index ranging from 20 to 80 were considered for final knowledge test.

2.2.2 Discriminatory index

While the difficulty level of an item determines in part, its ability to discriminate between farmers' different knowledge levels, items of the same difficulty level do not always discriminate equally well. A measure of discriminatory power was also obtained on the basis of high and low groups. Discriminatory index was computed for each item.S_1, S_2, S_5 and S_6 are the frequencies of correct answers in groups G1, G2, G5 and G6, respectively and N is the total number of respondents in the sample selected for item.

Discriminatory index (P) = $(S_1+S_2)- (S_5+S_6)/ N$

The items with discrimination indices ranging from 0.2 to 0.8 are selected for knowledge inventory items.

2.2.3 Point biserial correlation (r_{pbis})

The main idea of calculating point biserial (r_{pbis}) correlation was to work out the internal consistency of the item. The validity power of the item was computed by correlation of an individual item of preliminary knowledge test calculated by using the formula suggested by Garret [7].

$$r_{pbis} = \frac{M_p - Mq}{SD} X \sqrt{pq}$$

where,

r_{pbis} = Point biserial correlation
M_P= Mean of the total scores of farmers who answered each item correctly
M_P= Sum of XY/ Total number of correct answers
M_q= Mean of the total scores of farmers who answered each item incorrectly
M_q = Sum of x – Sum of y/ Total number of wrong answers
SD = Standard deviation of the entire sample
P = Proportion of farmers giving a correct answer to an item
q = 1-p

where,

P = Total no. of correct answers/ Total number of respondents

X = Total scores of farmers for all items
Y= Response of individual for the items correct= 1; wrong = 0
XY=Total score of the farmers multiplied by the response of individual to the item

Items having significant point biserial correction either at 1 per cent or 5 per cent level.

Representativeness of the test: The knowledge test covered entered universe of farmers' knowledge in rice seed production. It finally had 32 items comprising 15 test items of Yes/ No type; 12 items under multiple choice and 5 test items on fill in the blanks on farmers' knowledge in rice seed production technology.

2.3 Reliability

An instrument is reliable only when it gives constantly the same results when applied to the same sample. The split-half reliability of the test was determined by bifurcating the entire scale into two equivalent halves by splitting the items into two groups namely; odd and even. The scores obtained by the respondents over each of this half-length test were correlated by using the following formula:

Co-efficient of reliability = 2 roe/ 1+ roe
(Spearman Brown formula)

where,

roe = Correlation score of odd and even items

$$\text{Correlation of odd and even items} = \frac{\sum XY - \frac{\sum X \sum Y}{n}}{\sqrt{\left(\sum x^2 - \frac{(\sum x)2}{n}\right)\left(\sum y^2 - \frac{(\sum y)^2}{n}\right)}}$$

where,

∑x=Sum of scores of odd statements
∑y =Sum of scores of even statements
∑xy=sum of the product of odd and even statement scores.
$\sum_x^2$=Sum of the squares of odd statement scores
$\sum^{y2}$=Sum of the squares of even statement scores.
N=Size of sample

The total reliability co-efficient computed was 0.72 significant at 0.01 level of probability indicating thereby the evidence of reliability of the test.

2.4 Content Validity

The content validity of the knowledge test was derived from a long list of the test items. The test items represented the whole universe of rice seed production. It was thus assumed that the scores 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 farmers' knowledge in seed rice production and showed a great degree of reliability and validity indicating that the test items were valid.

3. RESULTS

3.1 Knowledge Test Containing Different Questioning Patterns with Final 32 Statements on Rice Seed Production

Farmers' Knowledge about quality seed production technology in Rice

The following items intended to measure the farmers' knowledge in rice seed production, please give answer to the following questions.

4. DISCUSSION

The standardized test will have practical applicability in ascertaining the direction of farmers' knowledge on rice seed production. This test will be used in identify the level of knowledge to farmers towards rice seed production.

The results from this test shows the farmers' knowledge that is needed for rice seed production.

Scoring Pattern: Each right answer carries one mark. The Maximum possible score for each farmer on all knowledge items is 32. By obtained scores of the farmers, the mean and standard deviation will be calculated. Based on this mean and stranded deviation they will be grouped into following categories.

Table 1. Knowledge test containing different questioning patterns

Sl.No	Test Items
I	**Please fill in the blanks given below**
1.	Age of seedlings at the time of transplantation in short duration varieties
2.	Recommended dose of fertilizer for 1 acre of main field during seed production
3.	Stem borer can be treated with
4.	Most recommended and better harvesting method in paddy seed production
5.	What is the moisture per centage for seed storage in paddy seed production
II	**Please give the response as Yes/ No**
6.	Breeder and/ or Foundation seed classes are best for seed production: Yes/No
7	Raised beds are to be preferred for best nursery management: Yes/No
8	Nursery for seed production should be very well decomposed to avoid the emergence of previous varieties: Yes/No
9	A combination of urea and neem increase the Nitrogen Use Efficiency: Yes/No
10	One should repeat the application of phosphorous after its basal application in any form: Yes/No
11	Zinc Sulphate ($ZnSO_4$) shouldn't be mixed with pesticides/ fungicides for applying to main field: Yes/No
12	Different morphological characters of selected plant variety can be identified at tillering stage: Yes/No
13	cold damage in nurseries can be avoided by covering with polyethene sheets: yes/no
14	The permissible admixture limit of paddy seeds with other variety seeds is @ 20seeds/kg of paddy seed: Yes/No
15	During initial cleaning in machine harvest, 1/4 of tank with harvested seed need to be discarded to avoid contamination with other seed/varieties, and is repeated for 2 to 3 times: YES/NO
16	Acaricide and fungicide combination is used to control the grain discolourtaion: Yes/No
17	Seed storage can be done at a place where fertilizers and pesticides are stored: Yes/No
18	As a good practice in storage bags should not be staked for more than 8 bags in row height to avoid pressure on seeds of lower bag: Yes/No
19	Fumigation need to be carried out in air tight bags in fully closed rooms to avoid storage pest: Yes/No
20	Discoloured seeds can be sold and used as seed for next season: Yes/No
III	**Please tick the appropriate answer**
21	What is the basis of variety selection in the paddy seed production? Season and duration-based /HYV/ Variety suitable for the location/ All the above
22	Which amongst the following is a seed borne disease? Blast/ Bacterial Leaf Blight/ Sheath blight/ All the above
23	Isolation distance between two different rice varieties should be maintained at (in meters)? 3/ 5/ 10/ 0
24	How many seedlings are transplanted in the main field per hill in seed production? 1-2/ 2-3/ 3-4/ No count needed
25	Number of plants per square meter, recommended for short duration varieties is? 44/ 34/ 25/ 70
26	The most preferred stages to rogue the paddy field? Tillering stage/ flowering stage/ pre-harvesting/ All the above
27	At flowering stage, how to identify the rogues (off types)? Early flowering and late flowering/ Boot leaf angle/ Anther colour/ All the above
28	The best recommended way to rogue the off types? Up root the plant/ Cut plant at base level/ Both/ None
29	Alley ways should be made in paddy field for? Better aeriation/ Convenient for intercultivation and sprayings/ To reduce pest/ All the above
30	Preferred percentage of genetic purity in paddy seeds? 98/ 80/ 100/ 75
31	The most ideal bags to store paddy seeds after proper drying? Jute canvas/ gunny bags/ Polyethene bags/ Air tight bags/ containers
32	The most common serious storage pest in paddy? Grain weevil/ Rice moth/ Khapra beetle/ All the above.

Table 2. The grouping details based on the mean and stranded deviation

Category	Scores
Low knowledged	Mean -1SD
Medium knowledged	Mean ±1SD
High knowledged	Mean +1SD

5. CONCLUSION

The process of developing and standardizing of knowledge test was finalized with 32 retained statements which have practical applicability in ascertaining the farmers' knowledge in rice seed production. This paper helps academicians and extension personnel who aid in the proper decision making by policy makers. The aforementioned is possible by giving the appropriate training and creating awareness about the different seed production aspects on rice. This test also aids in enabling the agriculture department in making future decisions regarding the development of seed programmes. These results can be validated with Barman, et al. [8] and Kumari and Husain [9].

CONSENT

As per international standard Farmers' consent has been collected and preserved by the author(s).

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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