

Construction and standardization of knowledge test to measure the level of knowledge of tribal farmers on seed banking

ABSTRACT

Intense knowledge on seed banks is prerequisite for ensuring seed banking and the associated traditional knowledge in tribal areas. Hence, it was thought necessary to construct a test for the purpose and an attempt has been made to develop a test for measuring knowledge of tribal farmers on seed banking. Pertinent items were collected covering all aspects of seed banking. The knowledge test was developed following step by procedures which included preliminary screening of the items based on Likert's method through calculation of t-statistics and mean score, followed by the item analyses through derivation of difficulty index, discrimination index and point biserial correlation coefficient. The final knowledge test contained 45 items which were retained from 60 items. Each item can be measured through two-point scale. The test was found to be highly stable and reliable which was indicated by highly significant value of reliability co-efficient (0.78). The social science researchers can use this to measure knowledge of tribal farmers on seed banking. It can help the extension personnel to formulate sound strategy to exploit the strong areas of knowledge and develop the weak areas of knowledge of the farmers regarding seed banking.

Keywords: Knowledge Test, Tribal Farmers, Seed Banking, Construction

1. INTRODUCTION

Access to good quality seed is a prerequisite of successful crop production as an enterprise (Njingulula *et.al* 2014). Seed banks can help farmers' to access seeds to grow crops during the next planting season or they can be used as an emergency seed supply when their crops are damage and destroyed. Seed banks usually store seed from a wide range of individuals, informal groups and NGOs who share seed among themselves (Lewis & Mulvany, 1997). They not only reduce farmers' dependence on seed companies but also help conserve the agro-biodiversity of their villages (V Lewis and P M Mulvany, 1997). Seed banking is operationalized as tribal farmers behavior in terms of seed saving, seed accessibility, seed production, seed storage, use and distribution to others. Promoting the local seed varieties through informal seed distribution systems such as community seed banks/seed banks is the need of the hour in tribal areas (Deepa Singh, Anil Subedi and Pitamber Shrestha. 2011). Despite having various advantages of seed banks, these did not get tribal farmers acceptance adequately. To promote seed banks in tribal areas it is essential to study knowledge of tribal farmers on seed banking activities, as knowledge forms an essential component in adoption of seed banks. Hence, in order to study the knowledge of tribal farmers on seed banking, a test has been developed.

2. METHODOLOGY

2.1 Collection of items

34 Initially 75 items were collected focusing on various aspects of seed banking "i.e."seed
35 accessibility, seed storage, use and seed distribution to others. Experts in the field of plant
36 breeding, seed technology and scientists working in tribal areas were consulted to collect the
37 above 75 items. After screening, fine tuning and editing based on the opinion of the
38 concerned scientists 60 items were retained. These 60 items were subjected to item analysis
39 to screen some more items based on the opinion of the respondents (from non sample
40 area).
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42 2.2 Item analysis

43 The item analysis was carried out in terms of three indices that are item difficulty index
44 and item discrimination index and point biserial correlation. The item difficulty index indicates
45 the extent to which an item was difficult. The item discrimination index provides information
46 on how well an item discriminates in agreement that is whether an item really discriminates a
47 well informed respondent from a poorly informed respondent. The point biserial correlation
48 provided information on how well item measures or discriminates in agreement with the rest
49 of the test.

50 Pretesting of the items was done as suggested by Gonard (1948). The 60 items were
51 revised and administered to 90 respondents selected for the purpose of pretesting in
52 controlled situation.

53 2.3 Item difficulty index (P)

54 The 60 items were administered to 90 non sample respondents with two point
55 response continuum. The scores allotted were one for correct response and zero for
56 incorrect response. After computing the total score obtained for each of the 90 respondents
57 on 60 items, they were arranged in order from highest to lowest scores. Based on which the
58 90 respondents were then divided into six equal groups. These groups were labeled as G₁,
59 G₂, G₃, G₄, G₅ and G₆ with 15 respondents in each group. For the purpose of item analysis,
60 the middle two groups G₃ and G₄ were eliminated keeping only four extreme groups with
61 high and low scores (Bloom *et al.* 1956).

62 The item difficulty index was worked out as the percentage of the respondents
63 answering an item correctly. The items with 'p' values ranging from 0.2 to 0.8 were
64 considered for the final selection of the knowledge test battery.

65 Item discrimination index (E 1/3)

66 The item discrimination index indicated by "E 1/3" which is calculated by the formula.

$$67 \quad \quad \quad (S1 + S2) - (S5 + S6)$$
$$68 \quad E\ 1/3 = \frac{\quad}{\quad}$$
$$69 \quad \quad \quad N/3$$

70 Where S1, S2 and S5, S6 are the frequencies of correct answers in the groups G₁,
71 G₂ and G₅, G₆ respectively. 'N' is the total member of respondents of the sample selected
72 for the item analysis that is 90.

73 The discrimination index varies from 0 to 1. The items with discrimination index
74 ranging from 0.2 to 0.8 were selected for the final test.

75 2.4 Point biserial correlation (r_{pbis})

76 The main aim of calculating point biserial correlation was to work out the internal
77 consistency of the items i.e. the relationship of the total score to a dichotomized answer to
78 any given item. In a way, the validity power of the item was computed by the correlation of

79 the individual item of preliminary knowledge test calculated by using the formula suggested
80 by Garret (1966).

$$81 \quad r_{pbis} = \frac{MP - MQ}{SD} \times \sqrt{pq}$$

84 r_{pbis} = Point biserial correlation.

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

$$86 \quad MP = \frac{\text{Sum total of } x \text{ } y}{\text{Total number of correct answers}}$$

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

$$90 \quad MQ = \frac{\text{Sum total of } x - \text{Sum total of } x \text{ } y}{\text{Total number of wrong answers}}$$

93 SD = Standard deviation of the entire sample.

94 P = Proportion of the respondents giving correct answer to the item.

$$95 \quad P = \frac{\text{Total number of correct answers}}{\text{Total number of respondents}}$$

98 q = Proportion of the respondents giving incorrect answer to the item

99 (or) $q = 1 - P$

100 X = Total score of the respondent for all items.

101 Y = Response of the individual for the "items i.e. (Correct = 1; Incorrect = 0)"

102 XY = Total score of the respondent multiplied by the response of the individual to the "item
103 i.e (Correct = 1; Incorrect = 0)"

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

106 Representativeness of the test

107 Care was taken to see that the test items selected finally covered the entire universe
108 of respondent's knowledge on seed banking behaviour.

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110 **3. RESULTS AND DISCUSSION**

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112 Out of 60 items, 45 items were finally selected based on

- 113 1. Items with difficulty level indices ranging from 0.2 to 0.8
- 114 2. Items with discrimination indices ranging from 0.2 to 0.8.
- 115 3. Items having significant point biserial correlation either at 1 per cent or 5 per cent
116 level.

117 Items have 0.80 and 0.20 as correct proportion. The average of these proportions is equal to
118 $(0.80 + 0.20)/2 = 0.50$.

119 Thus, the finally selected knowledge test items comprised of 4 types of questions viz.
120 true/false, multiple choices, fill up the blank questions and one word answer totaling to 45
121 items to measure the knowledge on seed banking behaviour. The selected items with P,
122 E1/3 and r_{pbis} values are given in the table 1.

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Table 1. Distribution of respondents based on knowledge test scores of item analysis

S.No.	Frequencies of correct answer of respondents in four extreme groups				Total frequencies of correct answers by all six groups	% of giving correct responses	Difficulty index	Discrimination power	Rp _{bis}
	G-1	G-2	G-5	G-6					
1.	15	15	7	6	64	71.11	0.71	0.6	0.642**
2.	11	6	8	5	40	44.44	0.50	0.1	0.188 ^{NS}
3.	12	12	10	9	64	71.11	0.72	0.16	0.219 ^{NS}
4.	12	9	6	0	39	43.33	0.45	0.5	0.443**
5.	12	9	3	0	33	36.67	0.40	0.6	0.514*
6.	13	13	11	9	71	78.88	0.76	0.2	0.239 ^{NS}
7.	12	9	0	0	24	26.67	0.35	0.7	0.670*
8.	6	11	4	6	39	43.33	0.65	0.23	0.171 ^{NS}
9.	15	3	3	1	21	23.33	0.4	0.5	0.254*
10.	7	7	6	4	34	37.78	0.40	0.1	0.115 ^{NS}
11.	12	12	9	0	60	66.67	0.55	0.5	0.460*
12.	12	3	6	0	27	30.00	0.35	0.3	0.361**
13.	12	9	8	8	56	62.22	0.61	0.16	0.232 ^{NS}
14.	10	10	6	6	45	50.00	0.53	0.26	0.205 ^{NS}
15.	15	15	12	12	81	90.00	0.90	0.2	0.121 ^{NS}
16.	15	6	0	0	24	26.67	0.35	0.7	0.422*
17.	15	9	6	3	51	56.67	0.55	0.5	0.399**
18.	15	6	6	3	36	40.00	0.50	0.4	0.43**
19.	12	9	6	0	39	43.33	0.45	0.5	0.443**
20.	15	9	3	0	30	33.33	0.45	0.7	0.697*
21.	15	12	6	3	66	73.33	0.60	0.6	0.479**
22.	9	15	6	0	39	43.33	0.50	0.6	0.450*
23.	12	15	3	6	51	56.67	0.66	0.6	0.493*
24.	15	9	3	3	45	50.00	0.50	0.6	0.550*
25.	15	12	6	0	45	50.00	0.55	0.7	0.577*
26.	15	3	3	6	42	46.67	0.45	0.3	0.390**
27.	15	0	3	3	24	26.67	0.35	0.3	0.325**
28.	15	6	3	0	30	33.33	0.40	0.6	0.647*
29.	15	3	3	0	36	40.00	0.35	0.3	0.251**
30.	9	12	3	0	39	43.33	0.40	0.6	0.592*
31.	12	15	3	6	51	56.67	0.66	0.6	0.493*
32.	12	9	3	0	36	40.00	0.40	0.6	0.251**
33.	12	15	3	6	51	56.67	0.66	0.6	0.493*
34.	6	6	0	0	27	30.00	0.20	0.4	0.224 ^{NS}
35.	10	4	1	3	21	23.33	0.3	0.3	0.374**

S.No.	Frequencies of correct answer of respondents in four extreme groups				Total frequencies of correct answers by all six groups	% of giving correct responses	Difficulty index	Discrimination power	Rp _{bis}
	G-1	G-2	G-5	G-6					
36.	7	7	3	1	24	26.67	0.3	0.3	0.374**
37.	12	12	9	4	51	56.67	0.65	0.3	0.264**
38.	11	10	9	7	51	56.67	0.61	0.1	0.203 ^{NS}
39.	12	4	0	0	24	26.67	0.30	0.6	0.611*
40.	12	6	0	3	33	36.67	0.35	0.5	0.456*
41.	9	12	0	0	33	36.67	0.35	0.7	0.612*
42.	12	12	3	0	45	50.00	0.45	0.7	0.476*
43.	15	15	6	6	60	66.67	0.70	0.6	0.539*
44.	15	12	9	3	60	66.67	0.65	0.5	0.414**
45.	9	11	6	9	41	45.56	0.58	0.1	0.117 ^{NS}
46.	15	9	3	0	39	43.33	0.45	0.7	0.580*
47.	15	15	9	6	75	83.33	0.75	0.5	0.562*
48.	15	15	4	6	60	66.67	0.70	0.6	0.539*
49.	12	12	3	0	33	36.67	0.45	0.7	0.655*
50.	15	15	6	12	78	86.67	0.80	0.4	0.439*
51.	11	4	2	4	21	23.33	0.35	0.3	0.381**
52.	10	11	9	6	57	63.33	0.60	0.2	0.186 ^{NS}
53.	14	15	14	12	76	84.44	0.91	0.1	0.183 ^{NS}
54.	13	9	7	8	52	57.78	0.61	0.23	0.201 ^{NS}
55.	10	12	11	07	64	71.11	0.67	0.1	0.223 ^{NS}
56.	9	6	0	3	33	36.67	0.30	0.4	0.379**
57.	15	12	4	0	51	56.67	0.55	0.7	0.675*
58.	15	9	3	0	39	43.33	0.45	0.7	0.580*
59.	13	11	5	2	51	56.67	0.51	0.56	0.596**
60.	15	12	3	3	45	50.00	0.50	0.6	0.546*

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* Significant at 0.01 % level of probability, Significant ** Significant at 0.05 % level of probability, NS: Non Significant

3.1 Standardization of the test:

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3.1.1 Reliability:

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The split half method

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Total 45 statements in the knowledge test were divided into two equal halves by putting the odd numbered items on one side and even numbered items on the other side. Both halves were considered as separate schedule with 22 and 23 statements each. Each set of half part of a schedule was administered on the same group of 30 respondents alternatively who were not included in the final sample. To find out the agreement between two sets of statements of the schedule, correlation coefficient was calculated and put to Spearman Brown prophecy formula as given here

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$$r_{11} = \frac{2(\text{roe})}{1 + \text{roe}}$$

142 Where roe is the coefficient of reliability of two half test i.e. odd and even and r_{11} is
143 the reliability coefficient of the entire test. Reliability coefficient for knowledge test was found
144 to be 0.78. The scores for the subjects on the two forms were correlated and this correlation
145 was taken as a measure of the reliability of the scales.

146 **3.1.2 Validity:**

147 **Content validation**

148 The content validity of the knowledge test was derived from a long list of test items
149 representing the whole universe of seed banking collected from various sources as
150 discussed earlier. It was assumed that the score obtained by administering the knowledge
151 test of this study measures what was intended to **measure**. Thus ensuring a fair degree of
152 content validity.

153 Thus the knowledge test developed in the present study measures the knowledge of
154 tribal farmers on seed banking as it showed a greater degree of reliability and validity.

155 **Selected items:**

156 **Fill in the blanks**

- 157 1. _____ is the best source of seed in your community.
- 158 2. By using _____ seed we can conserve genetic material.
- 159 3. In _____ way the demand for seed can be fulfilled.
- 160 4. _____ fungicide is used for seed treatment.
- 161 5. _____ percent moisture content should be maintained during seed
162 storage.
- 163 6. Before storing of harvested seed _____ operation is required.
- 164 7. The seed security can be achieved through _____ in tribal areas.
- 165 8. Seed exchange with in community members is known as _____.

166 **Multiple choices:**

- 167 9. What is meant by community seed bank?
168 a) Seed saving b) Seed accessibility c) Seed distribution d) All the above
- 169 10. In situ conservation of seed means, conserving the seed in
170 a) Natural population b) Community seed bank
171 c) Storage bins d) Conserving the hybrid seed
- 172 11. Can you give the meaning of individual seed exchange?
173 a) Individual purchased seed will be exchanged
174 b) Individual saved seed will be exchanged with other farmers
175 c) Seed exchanged with external agencies
176 d) Seed exchanged with other community members
- 177 12. Which is the best seed in tribal area?
178 a) Local seed varieties b) Hybrid seed
179 c) Seed from government agencies d) Seed from input dealers
- 180 13. For which purpose the saved seed can be utilized?
181 a) As seed for next season b) For own consumption

- 182 c) Exchange with others d) Both a& d
- 183 14. Products from which seed is healthier to human being and environment?
- 184 a) Seed from private agencies b) Hybrid seed
- 185 c) Seed from govt agencies d) Local seed varieties
- 186 15. Which seed will be available at lower price?
- 187 a) Local seed varieties b) Seed from govt agencies
- 188 c) Hybrid seed d) Seed from private agencies
- 189 16. In which way seed sovereignty can be achieved?
- 190 a) Seed from govt agencies b) Hybrid seed
- 191 c) Local seed varieties d) Seed from private agencies
- 192 17. Seed accessibility at community level can be improved through?
- 193 a) Input dealers b) Community seed banks
- 194 c) Seed from govt agencies d) Seed from private agencies
- 195 18. Which is the best source of seed for small and marginal farmers?
- 196 a) Seed from input dealers b) local seed varieties from farmers
- 197 c) Seed from govt agencies d) Seed from private agencies
- 198 19. Sustainable use of genetic resources can be achieved through?
- 199 a) Hybrid seed b) local seed varieties
- 200 c) Seed from govt agencies d) Seed from private agencies
- 201 20. Seed conservation and exchange at village level can be happen through?
- 202 a) Seed from govt agencies b) Hybrid seed
- 203 c) Community seed banks d) Seed from private agencies
- 204 21. Farmer's dependence on seed companies can be reduced through?
- 205 a) Local seed varieties b) Hybrid seed
- 206 c) Seed from govt agencies d) Seed from private agencies
- 207 **True/False**
- 208 22. Informal seed distribution system means, seed distribution with neighbors, friends
- 209 and relatives without any formal procedure.
- 210 23. Local seed varieties ensure that good quality seed is always available in tribal areas.
- 211 24. Local seed varieties ensure that seed is available at cheaper price.
- 212 25. The community seed bank become lively hood source of for farmers.
- 213 26. Local seed varieties will give good yield even in dry land areas also.
- 214 27. Local seed varieties will reduce input cost for cultivation.
- 215 28. Seed treatment necessary for the seed that you use.
- 216 29. Empowerment of farmer's organization can be achieved through activities like
- 217 community seed banks.
- 218 30. By using of high yielding varieties indigenous varieties depletion happen.
- 219 31. Community seed banks can act as an alternate income generating activity.
- 220 32. Reason for depletion of seed stock in the villages is use of hybrid seed.
- 221 **One word answer**
- 222 33. Indigenous seed variety means?
- 223 34. Please name any two indigenous varieties in your community?
- 224 35. What is meant by local seed fairs?

- 225 36. What is meant by farmer's right?
226 37. What is the difference between the local seed variety and hybrid seed?
227 38. What are the consequences of continuous using of hybrid seed and replacing the
228 local varieties?
229 39. Which is the best place for seed storage?
230 40. Please mention any one pesticide which will control the storage pest?
231 41. Tell any indigenous practice for rodent control?
232 42. How the seed is distributed from community seed bank?
233 43. Can you give any activity through which we can conserve agro biodiversity?
234 44. What are the different sources of seed collection in your community?
235 45. How can we establish alternate seed supply in tribal areas?
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237 4. CONCLUSION

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239 Understanding the knowledge of the individuals is very important in social science
240 research as it influences the adoption phenomenon to a great extent. A reliable and valid
241 knowledge test is required for this purpose. In the present study a knowledge test on seed
242 banking was developed and standardized. This knowledge test covered every possible area
243 of seed banking. It was found to be highly stable and reliable which was indicated by the
244 highly significant value of reliability co-efficient. The social science researchers can use this
245 to measure knowledge of tribal farmers on seed banking. It can help the extension personnel
246 to formulate sound strategy to exploit the strong areas of knowledge and develop the weak
247 areas of knowledge of the farmers regarding seed banking.

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