Development of a knowledge assessment tool to Measure Farmers' Understanding of Improved Groundnut Cultivation Practices

ABSTRACT

This study focused on assessing farmers' knowledge of improved cultivation practices in groundnut farming. An initial pool of 40 knowledge-related items was developed, drawing from various sources such as literature, input from field extension personnel, insights from relevant specialists, and the researchers' own expertise. After applying statistical procedures to ensure the reliability and validity of the knowledge test, the final set was refined to 21 items. This standardized knowledge test serves as a tool for evaluating the extent of farmers' understanding of advanced groundnut cultivation practices.

Keywords: Farmers, Knowledge test, Groundnut crop

1. INTRODUCTION

Groundnut (*Arachis hypogaea*), commonly known as peanut, is a vital leguminous crop extensively cultivated across India. It is a significant source of edible oil and protein, making it crucial for both domestic consumption and agricultural economies. India stands as one of the leading producers of groundnuts globally. In the agricultural Estimates Average for (2016-17 to 2020-21), Total area under groundnut cultivation was 4.95 Million Hectares, total production 8.35 Million Tonnes and productivity 1688 Kg/Hectare (E&S Division, DA&FW). Among the states, Gujarat is the top producer of groundnuts with 3.676 million tonnes, followed by Rajasthan with 1.895 million tonnes, Madhya Pradesh with 0.961 million tonnes, Tamil Nadu with 0.447 million tonnes, Karnataka with 0.257 million tonnes, and Telangana with 0.010 million tonnes, across an area of 0.462 million hectares. During the year 2020-21, the country exported 638,000 tons of groundnuts (APEDA). In Telangana, during the 2022-23 period, groundnut was grown across 103,000 hectares, yielding a production of 252,000 tonnes and achieving a productivity rate of 3,491 kg per hectare (Indiastat, 2024) across region making it one of the major crops of the state. It is widely grown in Mahbubnagar, Nagarkurnool, Wanaparthy, Warangal, Nalgonda and Karimnagar Districts.

“Despite its prominence, the groundnut sector in India and Telangana faces several challenges. These include issues related to pest and disease management, irrigation practices, and market fluctuations. The crop is susceptible to various pests such as the groundnut pod borer and diseases like rust and leaf spot, which impact both yield and quality” (Reddy & Maiti, 2023). “Additionally, inefficiencies in the supply chain and inadequate post-harvest handling contribute to significant losses. In recent years, there have been efforts to enhance groundnut cultivation through improved varieties, better agronomic practices, and increased research into disease-resistant strains” [9,10]. “The Indian government and agricultural research institutions are actively involved in developing strategies to address these challenges and improve productivity and profitability for farmers” (Melesse *et al*., 2023). Knowledge and adoption of scientific cultivation practices are crucial for advancing groundnut farming. By bridging the gap between traditional methods and modern agricultural techniques, farmers can achieve higher yields, better quality produce, and improved economic outcomes. This underscores the importance of developing and implementing comprehensive knowledge tests. Thus it may improve the farmers production by learning the scientific practices to be followed in cultivating the groundnut crop, strengthen the sector's overall resilience and improve the livelihood of the farmers. So based on this, the efforts are made to develop the knowledge test on cultivation practices of groundnut for the farmers in Telangana state.

2. METHODOLOGY

Mahabubnagar district of Telengana state was selected for the present investigation based on the Relative Spread Index (RSI) and Relative Yield Index (RYI) values of the district of the state for the groundnut crop. Two mandals viz. Koilkonda and Mohammadabad were selected purposively based on the highest area under the crop and from each block, three villages were chosen randomly. 10 respondents from each village were selected randomly thus resulting a total of 60 respondents for the study. Knowledge is a body of understood information possessed by an individual. For this study, knowledge was operationalized as the information and understanding of the farmer regarding scientific cultivation of Groundnut crop. For measuring the knowledge level, a knowledge test was developed and standardized. The details of the construction and standardization of this knowledge test is given below.

2.1 Collection of items

The content of a knowledge test is composed of questions called items. Items for the test were collected from different sources like literature, field extension personnel, relevant specialist and the researchers own experience. Items for the knowledge test were prepared based on three criteria. 1) It should promote thinking rather than mechanical memorization. 2) Items should differentiate the well-informed farmers from the poorly-informed farmers and should have a certain difficulty value. 3) Items included should cover all the areas of knowledge about ground nut cultivation practices.

Based on the above criteria, 40 items were initially selected encompassing major areas of Ground nut cultivation practices. The items selected were according to the level of knowledge and understanding of the farmers and level of technology of the area. A schedule was prepared with these 40 items for administering them to the farmer for item analysis and screen out non relevant and weak items. Correct replies for the items were ascertained in consultation with specialists and experts and incorporated in the schedule against each item. The items were in objective form and were Yes/No, Multiple choice etc.

2.1.1 Pre-testing

Pre-testing of the items was conducted following the method suggested by Gonard (1948). All 40 questions were administered to 60 groundnut farmers in a non-sample area. A score of '1' was assigned for a correct response and '0' for an incorrect response. After computing the total scores for each of the 60 respondents across the 40 items, the scores were arranged in descending order. The respondents were then divided into six equal groups, each consisting of ten members, labeled as G1, G2, G3, G4, G5, and G6. For item analysis, the middle two groups, G3 and G4, were excluded, retaining only the four extreme groups (G1, G2, G5, and G6) with the highest and lowest scores.

2.1.2 Item analysis

The item analysis was carried out regarding the difficulty index and discrimination index. The difficulty index reveals how difficult an item is, whereas the discrimination index indicates the extent to which an item discriminates the well informed individuals from the poorly informed ones. The items were revised and administered to 60 farmers in a controlled situation. The

respondents for administering the items were randomly selected and were not included in the final study. This was done to avoid testing effect. Nevertheless, these 60 respondents were representative of the community in which the final study was conducted.

Each one of the 60 respondents, to whom the test was administered was given a score 1 or 0 for each item, according to whether the answer was right or wrong. The total number of correct answers given by a respondent out of 40 items was the knowledge score of the individual. After calculating the scores obtained by 60 respondents, they were arranged from highest to lowest in order of magnitude.

i. Item difficulty index (P)

The difficulty index of an item reflects the percentage of groundnut farmers who answered that particular item correctly. It is calculated using the following formula:

$$Pi = \frac{ni}{Ni} x100$$

where:

P_i = Difficulty index in percentage for the i^{-th} item,

n_i = Number of groundnut farmers who answered the i^{-th} item correctly,

N_i= Total number of groundnut farmers who were given the i^{-th} item.

ii. Item Discrimination Index (E 1/3)

Discrimination index of each of the items were computed by using the following formula.

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

Where S1, S2 and S5, S6 are the frequencies of correct answers in the groups G1, G2 and G5 and G6 respectively. 'N' is the total member of respondents of the sample selected for the item analysis that is 60. The discrimination index varies from 0 to 1. The items with discrimination index ranging from 0.30 to 0.70 were selected for the final test.

3. RESULTS AND DISCUSSION

Out of a total of 40 items, 21 items were selected based on their difficulty indices ranging from 30 to 70, discrimination indices ranging from 0.30 to 0.70. These selected items were chosen to effectively measure the knowledge of groundnut farmers regarding improved groundnut cultivation practices. The final set of items included in the knowledge test were given below (Appendix).

3.1. Total items selected

Out of 40 items 21 items (table 1) were finally selected based on the following criteria. 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.

- Items with difficulty level indices ranging from 30 to 70.
- Items with discrimination indices ranging from 0.3 to 0.7.

Table 1: Selection of items for final knowledge test based on Item difficulty index, Item discrimination index

Sl.No	Frequencies of correct answer of respondents in four extreme groups				Total frequencies of correct answers by all six groups (n=60)	Difficulty index P (% of respondents giving correct responses)	Discrimination index (E1/3)
	G1	G2	G5	G6			
1.*	8	6	6	2	39	65.00	0.30
2. *	5	10	4	2	41	68.33	0.45
3. *	10	9	6	5	35	58.33	0.40
4.**	10	9	7	8	45	75.00	0.20
5. *	10	10	7	6	42	70.00	0.35
6. *	9	7	5	3	33	55.00	0.40
7.**	3	4	2	3	14	23.33	0.10
8.**	6	3	4	3	18	30.00	0.10
9. *	7	8	5	4	27	45.00	0.30
10. *	9	6	3	5	29	48.33	0.35
11.**	10	7	9	5	38	63.33	0.15
12.**	7	7	6	4	30	50.00	0.20

13. *	9	8	4	2	26	43.33	0.55
14. *	7	10	5	6	32	53.33	0.30
15.**	4	3	4	3	19	31.67	0.00
16. *	10	9	7	0	36	60.00	0.60
17.**	10	10	8	6	46	76.67	0.30
18.**	9	9	8	6	41	68.33	0.20
19. *	9	4	0	5	34	56.67	0.40
20.**	5	2	3	1	15	25.00	0.15
21.**	6	4	4	1	23	38.33	0.25
22.**	7	6	2	6	35	58.33	0.25
23. *	7	7	5	0	24	40.00	0.45
24.**	10	8	7	8	43	71.67	0.15
25.**	9	6	7	4	33	55.00	0.20
26. *	8	9	0	5	35	58.33	0.60
27.**	9	9	7	6	40	66.67	0.25
28. *	6	6	1	2	28	46.67	0.45
29. *	7	8	1	1	29	48.33	0.65
30. *	8	8	5	4	39	65.00	0.35
31. *	9	9	4	3	37	61.67	0.55
32.**	10	9	7	8	46	76.67	0.20
33.**	9	8	7	7	39	65.00	0.15
34.**	10	6	8	4	44	73.33	0.20
35. *	9	8	1	1	32	53.33	0.75
36. *	8	5	3	0	24	40.00	0.50
37.**	10	10	9	5	45	75.00	0.30
38. *	10	5	2	1	22	36.67	0.60
39. *	6	7	1	4	18	30.00	0.40
40.**	10	8	6	7	41	68.33	0.25

***Total Selected items=21; **Rejected items=19**

3.2. Reliability

Reliability of the test Split half method was used to compute the reliability of the test. The test administered to 60 respondents was divided into two halves based on odd and even numbered statements. Two sets of scores were derived on half forms of the test and the scores were correlated for the reliability of the half test. The self-correlation of the whole test was then estimated by the Spearman Brown prophecy Formula. The calculated value of reliability Co-efficient (0.82) for whole test found to be highly significant, hence it was concluded that test was reliable.

$$\textit{Reliability coefficient of the final test} = \frac{\mathbf{2\ x\ (reliability\ coefficient\ of\ the\ half\ test, found\ experimentally)}}{\mathbf{1 + (reliability\ coefficient\ of\ the\ half-test, found\ experimentally)}}$$

3.3. Validity of the test

The validity of the knowledge test of the farmers for farming practices of groundnut was obtained through content validity by consulting the scientists. The items selected for the knowledge test were evaluated individually and as a whole by the scientists. These were again checked by experts in the field for their coverage. The test's content validity was judged satisfactory because it was based on a variety of literatures and expert opinions (Devi et al., 2023; Beevi et al., 2022; Bharti and Sagar, 2022). 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 of farmers about farming practices of groundnut as it showed a greater degree of reliability and validity.

3.4. Administration and Scoring of the Test

A score of '1' was assigned for a correct answer and '0' for an incorrect answer for each item. The total knowledge score for each groundnut farmer was determined by adding the number of correct responses out of the 21 items. Therefore, the maximum possible score a groundnut farmer could achieve was 21, while the minimum possible score was 0. All 21 items in the knowledge test were read out to the respondents in a translated version (Telugu) by the investigator. The respondents were then asked to answer the items independently. The responses, indicating correct or incorrect answers, were recorded accordingly.

3.5. Categorisation of farmers based on knowledge level

The respondents were divided into three categories low, medium, and high based on the knowledge scores obtained. The groups are categorized using mean and standard deviation with the following formula

$$\bar{x} \pm \sigma$$

Where:

- ($\bar{x}$) represents the mean (average) of the data.
- σ\sigma represents the standard deviation.

Table 2: Categorisation of farmers based on knowledge level

Sl.No	Category	Frequency (n=120)	Percentage (%)
1.	Low	37	30.83333333
2.	Medium	59	49.16666667
3.	High	24	20

4. CONCLUSION

Accurate knowledge of groundnut cultivation is crucial for expanding agricultural entrepreneurship and for designing effective, need-based planning to enhance the socio-economic development of groundnut farmers. Currently, there is a lack of standardized methods to measure the knowledge levels of groundnut growers. In response to this gap, a comprehensive knowledge test was developed to assess the expertise of groundnut farmers. The resulting test proved to be robust and reliable for evaluating groundnut cultivation knowledge. Consequently, from an initial pool of 40 items, 21 were selected and included in the final version of the knowledge test.

Disclaimer (Artificial intelligence)

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc.) and text-to-image generators have been used during the writing or editing of this manuscript.

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APPENDIX

Standardized knowledge test for measuring knowledge of farmers on groundnut farming

Sl.no.	Knowledge items
1.	Mention the land preparation practices followed? -After removing the residues of previous crops, soil prepared to a good tilth.
2.	What is the recommended time of sowing in Rabi season? -1st fortnight of September to 2nd fortnight of November.
3.	What is the recommended seed rate for sowing groundnut? 80kgs/acre.
4.	What is the recommended groundnut variety for your area? a) Kadiri-6 ( ) b)TAG-2 ( ) c) JGT-2141 ( ) c) Kadiri Lepakshi ( ) d) Kadiri-9 ( ) d) Kadiri harithadri ( )
5.	Which fungicide is recommended for treating groundnut seeds? 1gm/kg tebucanazole (or) 3gm/kg with mancozeb. -Rhizobium culture 200 gms in seeds required
6.	What is the seed spacing recommended in Rabi groundnut?- 22.5cm× 10 cm.
7.	What is the recommended time of application of nitrogen fertilizer for groundnut crop?
8.	What are the fertilizers Applied in groundnut crop? -Application farm yard manure @ 3-4 tonnes/acre -Super phosphate 100kg, murate of Potash 33kg, urea 18 kgs /acre at the time of sowing and after 30 DAS 10-15kgs of urea application
9.	In groundnut gypsum is applied for? YES/NO
10.	What is the dosage of gypsum recommended for groundnut? Gypsum @ 200kgs

Application at peg formation stage

11. Any Micronutrients necessary for the crop? YES/NO

    -Application of zinc @ 400gms zinc sulphate in 200 lit water

12. How many days after sowing the groundnut crop should be kept free from weeds?

    -Maintain field with no weeds up to 45 DAS.

13. If Herbicides used mention the name of herbicide used _____

14. Mention the water management practices followed?

    - 450-600 mm water required for groundnut cultivation.

    -Sprinkler irrigation is best suitable.

15. What are the major pests effecting groundnut crop and mention the control measures recommended for management of pest?

    -Spodoptera litura-management grow trap crop castor (or) pheromone 4-5 traps /acre - Novaluron 200 ml/ 200 lit water

16. What are the recommended management practices for control of pest and diseases?

    -Stem rot- seed treatment with 1gm of tebuconazole per1kg seed.

17. Mention the harvesting practices followed?

    Harvesting at right maturity.

    - The method of harvesting

    a) Pod stripping( )

    b) Manual harvesting ( )

    c) Mechanical harvesters( )

18. What is the method of threshing followed?

    a)Manual( ) b)Dry pod thresher( ) c)Wet pod thresher( )

19. Mention the drying method followed?

    a)Heap method ( ) b)Tripod method( ) c) Flat bed method( )

    -Optimum drying the pods (below 10% moisture level).

20. What is the type of storage method followed?

    -The method of storage of pods

    a)gunny bags( ) b) polythene bags( ) c)Hermetic bags( )

    - Seeds stored with pods apply malathion 5% spray to control Storage pest

21. Mention the value addition practices followed

in groundnut? 1)Groundnut oil( ) 2)Roasted groundnut( ) 3)peanut butter( )
4) chikkis( ) 5) Other products( )