Development of Knowledge Test to Meausure the Knowledge Level of Cashew Growers in Srikakulam District of Andhra Pradesh

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ABSTRACT
Eighty five items of knowledge on production recommendations of cashew were selected from a large number of item pool collected based on standard criteria and in consultation with members of advisory committee, subject matter specialists of KVK, DAATTC, Scientists of Cashew Research Station and Horticulture Department, Andhra Pradesh. Finally 28 items were selected after following the statistical procedures for the construction of knowledge test.

Key words : Knowledge test, Cashew growers, Difficulty index, Discrimination index,
              Point biserial correlation.

Cashew cultivation in India dates back to 16th century with the introduction of the crop in the Malabar Coast of South India by Portuguese. It had been introduced to India just as other commercial crops like Rubber, Coffee, Tea *etc*. Later it has emerged as a major foreign exchange earner next only to Tea and Coffee. India is the second largest producer and exporter of cashew in the world next only to Vietnam. The current cashew production of the country accounts for 18.68% of the global production. Andhra Pradesh occupies first position in area (184 million ha.) and Maharashtra ranks first in both production (224.64 metric tonnes) and productivity (1.18 metric tonnes/ ha).

An appropriate knowledge test helps us to know the level of relevant knowledge of the participants from time to time. Knowledge test score is also used as a variable to test its relationship with other variables (Ray and Mondal, 2011).

Knowledge includes all those behavior and test situations, which emphasized the remembering either by recognition or recall of ideas, materials or phenomena (Bloom *et al.* 1956).

Knowledge as a body of understood information possessed by an individual or by a culture. (English and English, 1961).

Test is an organized succession of stimuli, designed to measure quantitatively or to evaluate qualitatively some material process, trait or characteristic (Bean, 1953).

Srikakulam district has congenial atmosphere for cultivation of cashew crop. The present extent of land under cashew cultivation is 23,355 hectares with a production of 13,759.63 tons with average productivity of 600 kg per hectare. There are some 110 cashew factories and 134 cashew processing units in the district in which around 29,000 persons are directly employed and thousands of others are indirectly depended on the industry for their livelihood.

In spite of several extension efforts, the Cashew growers did not have sufficient knowledge about specific production recommendations. This necessitated the development of a standard knowledge test for the accurate assessment of knowledge levels of Cashew growers.

MATERIAL AND METHODS
The present investigation was conducted in two villages viz., Borivanka, Byripuram and Pragadaputtuga of Kaviti mandal of Srikakulam district of Andhra Pradesh during March, 2014. The mandal was purposively selected as it has more area under Cashew cultivation. A total of 30 Cashew growers were selected randomly i.e. 10 cashew growers from each village constituted the sample.

The knowledge test was developed by employing the following methodology and the standardization of the test items were presented below.

A. Collection and Framing of Knowledge Items

A large number of items were obtained in consultation with the advisory committee members, subject matter specialists, scientists and field extension workers of Acharya N G Ranga Agricultural University and Horticulture department of Andhra Pradesh. They were collected from the recommendations of Acharya N G Ranga Agricultural University through the ZREAC proceedings and Vyavasaya panchangam, package of practices available through printed literature in Agricultural Information materials of District Agricultural Advisory and Transfer of Technology Centre (DAATTC), Krishi Vigyan Kendra (KVK), Amadalavalasa, Agricultural Research Station, Seethampeta, Regional Agricultural Research Station, Anakapalli, State department of Agriculture, Department of Horticulture, Farmers Training Centre (FTC) and Agricultural Technology Management Agency (ATMA).

Finally, 85 items were scrutinized after careful editing to develop standardize knowledge test. The items were then framed into objective form of questions, such as, multiple choice questions, fill in the blanks, true or false and yes or no types.

B. Selection of Items

Content of the test was composed of items asked in the form of questions. The criteria used for selecting the items were:

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

ii.   They should differentiate the well informed cashew growers from the less informed and should have certain difficulty value.

iii.   The items included should cover all areas of knowledge about selected production technology of cashew.

iv.   It means that the items which are not well understood by the people and items which can be correctly replied by all or none are not suitable for knowledge test.

C. Item Analysis

The item analysis was carried out as per the standard procedure, so as to yield three kinds of information viz., "item difficulty index", "item discrimination index" and "point biserial correlation". The index of the item difficulty reveals how difficult an item is, whereas discrimination index indicates the well informed individual from the poorly informed. The point biserial correlation provides information on how well an item measures or discriminates with the rest of the test items.

Pre-testing of the items was done as suggested by Gonard (1948). The items were revised and administered to thirty cashew growers selected for the purpose of pre-testing in controlled situation. Care was taken to see that thirty cashew growers were outside the main sample selected for the study. The data thus obtained was subjected to item analysis. To analyze 85 items each of the 30 cashew growers to whom the test items were administered was scored on the basis of the score allotted i.e. 1 for correct response and 0 for incorrect response. After computing the total score obtained by each of thirty cashew growers on 85 items, they were arranged in order, from highest to lowest. These 30 cashew growers were then divided into six equal groups, arranged in descending order of total scores obtained by them. These groups were labelled as G_1, G_2, G_3, G_4, G_5 and G_6 respectively with five cashew growers in each group. For the purpose of item analysis, the middle two groups G_3 and G_4 were eliminated keeping only four extreme groups with high and low scores. The data of correct responses for each of 85 items were tabulated for each of these groups. (Bloom *et al.* 1956).

D. Selection of the Items for the Final Test

i. Item Difficulty Index (P)

The item difficulty index for each of 85 items was calculated as the percentage of the cashew growers who answered an item correctly and is presented in Table 1. The items with 'P' values ranging from 20 to 80 were considered for the final selection of the standard knowledge test.

Difficulty Index (P) =

$$\frac{\text{No. of cashew growers answered correctly}}{\text{Total No. of cashew growers}} \times 100$$

ii. Discrimination Index ($E^{1/3}$)

Discrimination index of each of the 85 items were computed by using the following formula and presented in Table 1.

Table 1. Difficulty, Discrimination and Point biserial correlation of knowledge test items.

S.No.	Statements pertaining to selected production technology	Frequency of correct answers in the groups G1, G2, G5 and G6				Total frequencies of correct answers by all six groups (n=30)	Difficulty Index	Discrimination Index ($E^{1/3}$)	Point Biserial Correlation (rpbis)	't' Values
		S1	S2	S5	S6					
1.	Suitable soil for cashew cultivation	5	2	3	1	13	0.43	0.30	0.356	2.0158*
2.	Recommended variety for North Coastal Zone	3	3	2	4	16	0.53	0.00	-0.075	-0.3979NS
3.	Source of obtaining planting material/softwood grafts.	3	1	1	0	9	0.30	0.30	0.567	3.6423**
4.	Appropriate time for planting cashew grafts.	3	4	5	1	21	0.70	0.10	0.153	0.8192NS
5.	The appropriate age of seedlings selected for planting.	5	3	0	3	14	0.46	0.50	0.382	2.1872*
6.	Recommended pit size for planting of cashew grafts.	3	5	2	0	16	0.53	0.60	0.491	2.9823**
7.	Recommended spacing for cashew planting.	4	4	3	2	21	0.70	0.30	0.45	2.6664**
8.	Recommended quantity of Farm Yard Manure to be applied in pit before planting.	4	1	3	1	12	0.40	0.10	0.151	0.8082NS
9.	Recommended quantity of Single Super Phosphate to be applied per pit before planting.	4	2	0	1	12	0.40	0.50	0.563	3.6046**
10.	Recommended quantity of Neem cake to be applied per pit before planting.	2	3	1	2	14	0.46	0.20	0.369	2.1008*
11.	Recommended ratio of Nitrogen-Phosphorous-Potassium fertilizers to be applied for the trees above five years.	4	1	2	3	13	0.43	0.00	0.015	0.0793NS
12.	Recommended quantity of Urea to be applied per tree per year is per year.	4	3	4	3	22	0.73	0.00	0.096	0.5103NS
13.	Recommended quantity of Single Super Phosphate to be applied per tree per year.	4	4	1	1	14	0.46	0.60	0.567	3.6423**
14.	Recommended quantity of Murate of Potash to be applied per tree per year.	0	1	0	0	3	0.10	0.10	0.097	0.5157NS
15.	Recommended radial distance from the tree trunk for fertilizer application.	5	4	3	3	24	0.80	0.30	0.387	2.2208*

Table 1. cont.........

16.	Stem and Root Borer is more prevalent in trees of above 7 years.	3	4	0	2	14	0.46	0.50	0.364	2.0679*
17.	The Recommended Chemical for the control of Stem and Root borer.	4	4	3	4	22	0.73	0.10	-0.012	-0.0635NS
18.	Damaged parts of T-Mosquito Bug.	3	2	3	1	15	0.50	0.10	0.036	0.1906NS
19.	Identification symptoms of Fruit and Nut borer.	5	5	4	4	27	0.90	0.20	0.278	1.5314NS
20.	Recommended chemical for the control of Fruit and Nut Borer.	5	4	4	4	24	0.80	0.10	0.135	0.7209NS
21.	Identification symptom of leaf miner.	4	5	3	4	20	0.66	0.20	0.202	1.0913NS
22.	The Recommended chemical for the control of Leaf and Blossom Webber.	4	3	5	4	22	0.73	-0.20	-0.222	-1.2047NS
23.	Time interval between the fruit formation and maturity.	3	4	1	5	17	0.56	0.10	-0.085	-0.4514NS
24.	Average yield of above ten years old cashew nut tree.	5	3	2	3	20	0.66	0.30	0.411	2.3856*
25.	First split application of recommended fertilizer is inJune-July months.	4	3	5	4	23	0.76	-0.20	-0.133	-0.7100NS
26	Tree trenches are covered with dry leaves in summer to control evaporation.	5	1	2	1	13	0.43	0.30	0.374	2.1338*
27.	Frequent irrigation should be provided at three stages namely new flushing, flowering and fruiting.	5	4	4	3	24	0.80	0.20	0.417	2.4277*
28.	Method of irrigation followed in cashew.	5	5	4	5	26	0.86	0.10	0.142	0.7590NS
29.	Dieback of shoots and scorched appearance of the inflorescence are the symptoms of	2	2	1	0	7	0.23	0.30	0.321	1.7934NS
30.	Dropping of fruits caused by fruit and nut borer.	5	4	4	4	26	0.86	0.10	0.135	0.7209NS
31.	Mixing of soil with Carbaryl dust 500g before the onset of monsoons will helpful in controlling Cashew Stem and Root Borer (CSRB).	4	2	3	4	18	0.60	-0.10	-0.031	-0.1641NS
32.#	Cashew plantation does not require irrigation up to two years from the date of planting.	5	5	5	4	27	0.90	0.10	0.285	1.5733NS
33.#	Organic manures shall not be applied in first year of Cashew plantations	4	5	2	3	22	0.73	0.40	0.464	2.7716**
34.	Cashew plantations need pruning and training up to one meter from the ground for proper growth in the initial years of planting.	4	4	3	3	21	0.70	0.20	0.107	0.5694NS
35.#	Paddy and Tobacco nurseries can not be raised as inter crops in early cashew plantations.	2	1	2	1	11	0.36	0.00	-0.077	-0.4086NS

Table 1. cont........

36.# Leaf and Blossom Webber can be controlled by spraying Monocrotophos without disturbing the webs.	4	3	2	2	13	0.43	0.30	0.426	2.4915*
37. Removal of root suckers is essential in first year of cashew plantation.	5	4	4	1	20	0.66	0.40	0.453	2.6887**
38. Stem and Root Borer can be effectively controlled by brushing the trunk up to 3 ft high and roots above the soil and spraying of 5% Neem oil solution once in four months.	5	3	5	4	24	0.80	-0.10	-0.039	-0.2065NS
39. Neem oil solution can be prepared by mixing 0.5g of Soap /Surf in two Litres of water and then mixing with 50ml of Neem oil.	3	4	2	2	17	0.56	0.30	0.205	1.1082NS
40. Stem and Root Borer usually get propagated through neglected orchards.	4	2	1	2	14	0.46	0.30	0.372	2.1206*
41. Uprooting the trees when plant leaves turn yellow and destroying the pupa helps in the control CSRB.	5	5	5	3	25	0.83	0.20	0.348	1.9642NS
42. The pits where from cashew trees are removed must be filled with dried leaves.	5	3	4	3	22	0.73	0.10	0.216	1.1705NS
43. The effective measure of controlling the Stem and Root Borer is insertion of Aluminium phosphide tablets in the chiselled out holes of trunk.	5	5	5	4	27	0.90	0.10	0.285	1.5733NS
44. Spraying after drying due to heavy T-Mosquito Bug infestation is not useful.	4	5	5	4	26	0.86	0.00	0.036	0.1906NS
45.# Removal of flowers in the first two years of cashew plantation is not essential.	4	4	5	2	23	0.76	0.10	0.083	0.4407NS
46. Cashew plantation does not require irrigation after March.	4	4	3	4	21	0.70	0.10	0.072	0.3819NS
47. Yellowing and shedding of leaves and drying of twigs caused by Stem and Root Borer.	5	5	4	3	26	0.86	0.30	0.344	1.9385NS
48. Stem and Root Borer can be effectively controlled by spraying 4% Carbaryl solution over the bark of the trunk.	4	5	4	1	21	0.70	0.40	0.512	3.1540**
49. Spraying of Profenophos one 1ml / Litre or Chloripyriphos 2.5ml / Litre helps in the control of Thrips.	2	3	1	2	11	0.36	0.20	0.197	1.0632NS
50.# Fog is not the causative factor for flower dropping.	4	5	2	2	19	0.63	0.50	0.453	2.6887**
51. Cashew grafts does not require irrigation at the beginning of monsoon.	5	4	5	4	27	0.90	0.00	0.088	0.4674NS
52. Cashew plantation needs irrigation at 7 days interval during fruit formation.	5	5	1	3	23	0.76	0.60	0.547	3.4575**
53. Apple colour of BPP-6 variety of cashew is yellow.	5	5	5	5	29	0.96	0.00	0.019	0.1005NS

Table 1. cont.........

54.# BPP-6 variety comes for flowering and fruit bearing during March to June.	5	4	4	1	21	0.70	0.40	0.465	2.7793**
55. Decortication of cashew nuts results in oozing out of pale yellow to dark Brown viscous oily liquid with bitter taste.	5	5	3	2	23	0.76	0.50	0.279	1.5373NS
56. The selected cashew grafts for planting should have 10-15 leaves.	4	5	3	2	22	0.73	0.40	0.315	1.7562NS
57. Seedling material should be planted 10 cm above the soil.	3	3	3	0	10	0.33	0.30	0.331	1.8561NS
58.# Cashew plantations require TADI fencing on all sides after 2-3 years of planting	4	3	1	1	14	0.46	0.50	0.378	2.1604*
59. Marygold/Chrysanthemum can be grown as intercrops in the early cashew plantations	5	4	3	4	21	0.70	0.20	0.228	1.2390NS
60. Ring method is the appropriate method of fertilizer application in cashew plantation.	4	5	4	3	26	0.86	0.20	0.111	0.5910NS
61. Neem trees must be removed in the surroundings of cashew plantations to control T-Mosquito Bug.	4	3	1	2	13	0.43	0.40	0.405	2.3438*
62. Ploughing the field between the rows in early days after planting helps to make the orchard weed free.	5	5	4	5	29	0.96	0.10	0.118	0.6287NS
63.# The appropriate time for the second dose of fertilizer application is December-January.	4	2	2	1	16	0.53	0.30	0.521	3.2298**
64. Presence of small holes in the collar region is the symptom of CSRB.	4	4	1	2	17	0.56	0.50	0.44	2.5927*
65. Stem and Root Borer can be controlled by chiselling out the grubs from the bottom of the trunk.	4	3	4	3	23	0.76	0.00	0.119	0.6341NS
66. Gummosis is the symptom of CSRB.	5	4	3	1	19	0.63	0.50	0.363	2.0614*
67.# Severe attack of Thrips causes dieback of young shoots.	5	2	1	3	16	0.53	0.30	0.466	2.7869**
68.# Fruits having the frass at Apple and Nut joint is the symptom of Thrips.	4	3	4	2	21	0.70	0.10	0.208	1.1252NS
69. The effected cashew apples by Fruit and Nut borer must be burried deep into the soil.	5	4	5	3	23	0.76	0.10	0.222	1.2047NS
70. Rainy season increases the incidence of T-Mosquito Bug population.	3	2	4	1	13	0.43	0.00	0.15	0.8028NS
71. T-Mosquito Bug can be effectively controlled before the majority of shoots get damaged.	5	4	4	3	24	0.80	0.20	0.228	1.2390NS
72.# Scorched appearance of inflorescence is the symptom of Stem Borer.	5	5	1	2	18	0.60	0.70	0.613	4.1055**
73. The effective stages of controlling T - Mosquito Bug include new flushing, early flowering fruit formation stages.	5	5	4	4	26	0.86	0.20	0.313	1.7438NS

Table 1. cont.........

74.# T - Mosquito Bug attacks the leaves and shoots only.	4	3	1	2	17	0.56	0.40	0.415	2.4136*
75. Drip irrigation in cashew nut cultivation saves 60 percent of water.	5	5	5	3	27	0.90	0.20	0.334	1.8750NS
76. Cashew plants grown from the grafts yields more nuts than seedling grown trees.	4	3	2	4	20	0.66	0.10	0.099	0.5264NS
77. Soil is enriched due to the application of Cashew apple around the tree trunk.	4	5	4	2	25	0.83	0.30	0.149	0.7973NS
78. Harvesting shall be done in the months of March-May.	5	5	5	4	29	0.96	0.10	0.213	1.1535NS
79. Gap filling is essential for increasing productivity.	5	5	3	5	27	0.90	0.20	0.209	1.1308NS
80. Pinkish colour is the index of complete drying.	4	2	3	1	17	0.56	0.20	0.312	1.7376NS
81. Dried nuts produces rattling sound when shaken.	5	5	5	5	27	0.90	0.00	0.095	0.5049NS
82. Marks can not be made on dried nut by thumbnail.	5	4	5	2	25	0.83	0.20	-0.033	-0.1747NS
83.# Apple colour of BPP-5 variety of cashew is brown.	4	4	5	4	26	0.86	-0.10	-0.196	-1.0576NS
84. Decortication of cashew nuts causes blisters on the skin.	5	5	5	4	28	0.93	0.10	-0.141	-0.7536NS
85. The pale yellow to dark brown colour liquid coming out of decortication spoils the kernels.	4	2	3	1	20	0.66	0.20	0.286	1.5793NS

\# indicates negative statement
* Significant at 0.05 level of probability
** Significant at 0.01 level of probability
NS = Non-Significant

Discrimination Index $(E^{1/3})$ =

$$\frac{(S1 + S2) - (S5 + S6)}{\frac{N}{3}}$$

Where,
S_1, S_2, S_5 and S_6 are the frequencies of correct answers in groups as G_1, G_2, G_5 and G_6 respectively. 'N' is the total number of cashew growers selected for item analysis i.e., 30. The items with $E^{1/3}$ values ranging from 0.20 to 0.80 were selected for the construction of final knowledge test.

iii. Point biserial correlation (rpbis)
    Point biserial correlation was calculated to work out the internal consistency of the items i.e. relationship of the total score to a dichotomized answer on any given item. It was calculated by using the following formula suggested by Garrett (1966).

$$\text{rpbis} = \frac{\mathbf{MP - MQ}}{\mathbf{SD}} \text{ X } \sqrt{\mathbf{PQ}}$$

Where,
rpbis = Point biserial correlation
MP = Mean of the total scores of the cashew growers who answered the items correctly

(or)

$$MP = \frac{\textbf{Sum of total of XY}}{\textbf{Total No. of correct answers}}$$

MQ = Mean of the total scores of the cashew growers who answered the items incorrectly

(or)

$$MQ = \frac{Sum\ total\ of\ X - Sum\ total\ of\ Y}{Total\ No.of\ wrong\ answers}$$

SD = Standard deviation of the entire sample (30No.)

P = Proportion of the cashew growers giving correct answer to the item

(or)

$$P = \frac{Total\ No.of\ correct\ answers}{Total\ No.of\ cashew\ growers}$$

Q = Proportion of the cashew growers giving incorrect answer to the item

(or)

Q = 1 – P

X = Total score of the cashew grower for all items

Y = Response of the individual for the items (Correct = 1, Incorrect = 0)

XY = Total score of the cashew grower multiplied by the response of the individual to the item Items having significant biserial correlation, either at a per cent or 5 per cent level were selected for the final test of the knowledge test. (Table1) To set significance of point biserial correlation co-efficient the following 't' test was used.

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

The resulting co-efficient is a product moment correlation co-efficient and is used and interpreted just as the Pearson correlation co-efficient.

E. Total items selected

Out of 85 items, 28 items pertaining to production recommendations of Cashew were finally selected comprising of four formats of the test that are multiple choice, fill in the blanks, true or false and yes or no.

F. Reliability of the test

Split half reliability method was used to find out the reliability. The test was administered to thirty cashew growers. The two sets of knowledge scores obtained from the cashew growers were correlated. The correlation (r=0.56) was highly significant indicating a high degree of dependability of the test for measuring knowledge level of cashew growers.

G. Validity of the test

The validity of the test items was tested by the method of point biserial correlation (rpbis).The items with significant correlation coefficients either at 1 or 5 per cent level were included in the standard knowledge test designed to measure the knowledge level of cashew growers.

LITERATURE CITED

Bean K L 1953 *Construction of Educational and Personnel Tests.* McGraw-Hill Book Co., New York.

Bloom B S, Engelhardt M, Frust E, Hill W and Rathwal D R 1956 *Taxonomy of Educational Objectives, The Cognitive Domain,* Orient Longmans, New York.

English H B and English A C 1961 *A Comprehensive Dictionary of Psychological and Psychoanalytical Terms.* Longmans Green and Co., New York.

Garrett H E 1966 Statistics in Psychology and Education. David Mckay Company Inc. and Longman Group Ltd., New York.

Gonard H S 1948 *Characteristics and Uses of Items Analysis of Data.* Psychological monograph.

Ray G L and Mondal S 2011 *Research Methods in Social Sciences and Extension Education.* Kalyani Publishers, New Delhi, 179pp.