

**Construction of Knowledge Test to Measure Knowledge Level of Apple Growers of Arunachal Pradesh on Package of Practices of Apple**

**ABSTRACT**

The knowledge test was developed to measure the knowledge level of apple growers. 32 items were primarily fabricated on the basis of ratifying rational rather than rote memorization and to classify the sound erudite apple growers from the ailing erudite ones. The scores obtained from sample respondents were exposed to item analysis, embracing of item difficulty index & item discrimination index. In the ultimate selection, the scale consisted of 22 items with difficulty index ranging from 30-80 and discrimination index ranging from 0.30 to 0.55. To check the reliability of knowledge test being developed Split-Half method was employed and it was found to be 0.701.

**Keywords:** Knowledge test; Apple growers; Difficulty index; Discrimination index; Reliability

**INTRODUCTION**

Apple (*Malus domestica*; family-Rosaceae) is a deciduous fruit mainly grown in the north western mountainous states of India like Himachal Pradesh, Uttarakhand, Jammu and Kashmir. In the north eastern region of India it is grown in few hilly states like Arunachal Pradesh, Nagaland, Sikkim on a limited scale. Two leading apple producing states in India are Jammu and Kashmir and Himachal Pradesh, known for their distinctive and popular varieties and are also branded as the apple state of India. In the world, India is the 4th largest producer of apple. The total production and area under apple cultivation in India is reported to be 277.2 Thousand Ha and 2521.1 Thousand MT with productivity of 9.1 MT/Ha in the year 2015-16. India exports 21085.23 MT of apple in 2016-17. 2.56 Thousand MT of apple was being exported with a total output value of ₹14196.85 Lakh [1]. Postharvest losses of apple in India in the year 2015 was reported to be 10.39 per cent [2]. The total area and production under apple cultivation in Arunachal Pradesh during the year 2015-16 was reported to be 4682 Ha and 7281 MT as well as productivity of 1.55 MT/Ha respectively. Apple growing includes West Kameng, Tawang, Lower Subansiri, Dibang Valley, West Siang, Upper Subansiri etc.[3]. The supply chain of apples in the state is laden with inadequacies across the entire chain leading to deprived price realization of growers on one hand and inflated prices paid by consumers on the other. The study further revealed that the average loss occurring at the farmer's level was 1116.17 kg per farmer and ₹31,709.17 per farmer. The loss in volume was found to be 11.07 per cent of the total production and 12.20 per cent of the total value of the produce. [4]. Arunachal Pradesh has earned ₹24278 lakh by selling of apple. In case of Arunachal Pradesh, good quality apple is grown in the West Kameng district which produces the highest amount of apple in the state [5]. Apple was introduced in the West Kameng district during 1960s. Major producing areas under the West Kameng district includes Zimthung, Dirang, Shergaon, Morching, Wangho, Chillipam, and Jigaon. The infestation of pest and diseases was the most austere problem reported by the farmers. The farmers also reported problems of maintenance of orchard, lack of technical knowledge, problem of marketing, training and know-how, non-availability of labour, problem of storage, risk factor and failure of extension service, insufficient finance, erratic supply of seeds and intermittent supply of seeds and derisory availability, road connectivity etc.[6].

Knowledge is an essential tool, which enables farmers in decision making to embrace the endorsed practices to make apple farming more lucrative and viable. The knowledge test of apple may also craft the understanding about prominence of promoting scientific cultivation practices by the growers as well as help to bond the knowledge gap between the farmer and researcher and harvest gap between farmer's field and research station. Thus, it may also accelerate the growers to upsurge the turnover and have amended livelihood security, competence to educate their children, tenable source of income and abridged vulnerability. On this background, an effort was made to develop a knowledge test on cultivation practices of apple for its application to the farmers in Arunachal Pradesh.

53 **MATERIALS AND METHODS**

54 Item collection: The content of knowledge test was composed of queries called items. Items for the  
55 test were amassed from diverse sources, such as field extension personnel, subject matter specialists  
56 in horticulture, literature, and the investigator's own experiences. The queries were designed to  
57 measure the knowledge level of apple growers about cultivation practices of apple.

58 Preliminary medley of items: The hotchpotch of items was done on the basis of the following  
59 standards:

60 (i) It should be logical rather than rote-memorization, and

61 (ii) It should disengage the well-informed apple growers from the ill-informed ones and have a  
62 convinced difficulty value. Based on these two means 32 items were initially collected for formation of  
63 the knowledge test which were in objective form *i.e.* dichotomous or multiple choice format. A  
64 schedule was thus prepared with these 32 items for administering it to the apple growers for item  
65 analysis and screen out additional items.

66

67 **RESULTS & DISCUSSION**

68 **Preliminary administration of test:** Items were pretested in Ramalingam village under  
69 Singchung Circle of West Kameng District and administered to 30 randomly selected apple growers.  
70 Score was given as '1' for right and 0 for wrong answer for each of the 32 items. The total accurate  
71 response was the knowledge score obtained by an individual farmer. The farmers were then  
72 distributed into 6 groups (G1 to G6) each consisting of 5 farmers. The farmers in each group were  
73 arranged in plummeting order according to the scores obtained by them. Only four extreme groups  
74 with high and low scores were ruminated for calculation of item difficulty and item discrimination  
75 indices.

76 **Item analysis:** The item analysis of a test provides two types of information: item difficulty and item  
77 discrimination as informed by Guilford [7]. The index of item difficulty exposed how challenging an item  
78 was whereas the index of discrimination quantified the extent to which an item discriminates to  
79 well-informed individuals from the ill-informed ones.

80 **Item difficulty index (Pi):** The difficulty index of an item was defined as the proportions of apple  
81 growers giving precise responses to that particular item. This was calculated by the formula:

82 
$$P_i = n_i / N_i \times 100$$

83 Where,  $P_i$  = Difficulty index in percentage of the  $i^{th}$  item.

84  $n_i$  = Number of apple growers giving correct response to  $i^{th}$  item.

85  $N_i$  = Total number of apple growers to whom  $i^{th}$  item was administered

86 **Item discrimination index:** The discrimination index was calculated by administering the method  
87 given by Mehta [8]. Item discrimination index was calculated by the formula given below:

88 
$$E^{13} = \frac{(S1 + S2) - (S5 + S6)}{N/3}$$

89 Where, S1, S2, S5 and S6 were the respective frequencies of correct answers in G1, G2, G5 and G6  
90 groups respectively, and N = Total number of apple growers in the sample of item analysis.

91 **Selection of items for test:** Two criteria *i.e.* item difficulty index and item discrimination index  
92 were calculated for throng of items in the final set-up of the knowledge test. In the current study, items  
93 with difficulty index faltering from 30 to 80 and discrimination index faltering from 0.30 to 0.55 were  
94 included in the final format of the knowledge test. Item difficulty index and item discrimination index of  
95 all the 32 items were calculated and 22 items which fulfilled both the gauges were selected for the  
96 final format of knowledge test as shown in Table-1.

97 **Table 1:** Difficulty Index (DI) and Discrimination Index (Disc. Index) for Knowledge Test Items

Item No.	Statements	DI	Disc. Index	S= Selected item and R = Rejected item
1.	Which of the following variety of apple is/are recommended for your area? Kindly suggest any other variety if you know.	63.33	0.7	R
2.	Do you know the most suitable time/month for plantation of apple and its follow-up?	66.67	0.8	R
3.	Do you know the optimum temperature during the growing season for apple cultivation?	80	0.3	S
4.	Which of the following is/are the soil recommended for improved apple cultivation?	76.67	0.3	S
5.	Do you seed treatment of apple for improved cultivation? If Yes, kindly share your knowledge/skill.	23.33	0.5	R
6.	Which of the following is/are the recommended pit size for apple transplantation?	76.67	0.4	S
7.	What is/are the recommended spacing for apple cultivation?	80	0.3	S
8.	Which of the following is/are the number of apple plants that you can grow in 1ha of land?	73.33	0.4	S
9.	What do you understand by the term training of apple?	76.67	0.4	S
10.	What do you understand by the term pruning of apple?	73.33	0.4	S
11.	What is/are the quantity of farm yard manure to be incorporated during planting?	73.33	0.3	S
12.	What is/are the total recommended fertilizer dozes for improved apple cultivation?	66.67	0.2	R
13.	Which of the following is/are the recommended time period for irrigation?	56.67	0.7	R
14.	Which of the following irrigation system is/are the recommended for large commercial plantation of apple?	76.67	0.3	S
15.	Do you know about weeding schedule in apple? If yes, how do you follow the recommended schedule of weeding to control the weed?	20	0.4	R
16.	Do you know what kind of material is used for mulching an apple tree?	73.33	0.4	S
17.	Are you aware about the important pests of apple?	80	0.5	S
18.	Are you aware about the diseases of apple?	73.33	0.4	S
19.	Do you know IPM on improved apple cultivation? Please share important IPM techniques on improved apple cultivation.	10	0.1	R
20.	Which method of propagation of apple yields early maturing of fruits?	63.33	0.1	R
21.	What do you understand by the term Hybrid? If yes, mention hybrid varieties of apple.	26.67	0.2	R
22.	In which of the following year/years apple starts bearing fruits?	76.67	0.3	S
23.	Which of the following is/are the indication for harvesting of apple?	66.67	0.2	R
24.	Which of the following is/are relative humidity during storage of apple?	56.67	0.3	S
25.	Which of the following is/are the optimum temperature during the storage of apple?	76.67	0.5	S
26.	Which of the following is/are the reason apple fruits are placed in a cool and ventilated place?	56.67	0.3	S

Item No.	Statements	DI	Disc. Index	S= Selected item and R = Rejected item
27.	What are the consequences of keeping bee colonies in apple orchard?	80	0.3	S
28.	Which of the following is/are the storage life of apple fruits after harvesting?	56.67	0.3	S
29.	What do you understand by the term grading of apple. If you know, please mention grading of apple fruits is done on what basis?	53.33	05	S
30.	Which of the following is/are the materials used for packing apple fruits?	70	.04	S
31.	Which types of planting method is used in valleys/slopes?	50	0.3	S
32.	Do you know and visit nearby market where apple auction is held to market the produce?	60	0.3	S

98 **Reliability:**The reliability of knowledge test being developed was tested by using Split-Half method:  
99 The coefficient of correlation between two sets of scores was calculated and found to be 0.701 was  
100 significant at 1% level thus indicating that the internal consistency of the knowledge test developed for  
101 the study was relatively high.Knowledge test developed for cotton farmers on health hazards of  
102 pesticides usage included 26 item statements as indicated by [9]. Knowledge test constructed on  
103 package of practices of paddy comprisedof 35 item statements as reported by [10]. Knowledge test  
104 developed for farmers on chickpea demonstration consisted of 15 item statements in the final  
105 selection as signposted by [11]. Knowledge test constructed for agricultural extension personnel on  
106 m-toolscontained 14 item statements in final selection as stated by [12]. Knowledge test constructed  
107 forfarmers on SRI technologyencompassed of 33 item statements as indicated by [13]. Knowledge  
108 test on vegetable farming (cauliflower and carrot) comprisedof 11 items as stated by [14]. Out of  
109 aggregate 55 items, 20 items were finally selected where 8 items represented knowledge on  
110 mitigation practices and 12 items on adaptation practices of climate change [15]. Knowledge test on  
111 natural resource management practices comprisedof 30 items as stated by [16]. Out of 46 items on  
112 knowledge test developed for IPM, INM and IWM Practices,28 items were selected in the final  
113 formatas stated by [27].

## 114 CONCLUSION

115 For entrepreneurship expansionprecise knowledge of growing apple is of prime importance. It is also  
116 pivotal for evaluation and framing need based planning for the socio economic progression of apple  
117 growers. Barely there is any such standard technique for measuring the knowledge level of apple  
118 growers. With this anecdotal a knowledge test scale was developed to envision the knowledge level  
119 of the apple growers. Knowledge test fabricated was found to beextremely firm and unswerving for  
120 measurement of the knowledge level of the applegrowers. So, out of the cumulative 32 item  
121 statements only 22 item statements were integrated in the final knowledge test.

## 122 REFERENCES

- 123 1. Government of India, Ministry of Agriculture & Farmers Welfare Department of  
124 Agriculture,Cooperation & Farmers Welfare, Horticulture Statistics Division. Horticultural  
125 Statisticsat a Glance; 2017.
- 126 2. Jha SN, Vishwakarma RK,Ahmad T, Rai A, Dixit AK. Report on Assessment of Quantitative  
127 Harvest and Post-Harvest Losses of Major Crops/Commodities in India. ICAR-All India  
128 Coordinated Research Project on Post-Harvest Technology, ICAR-CIPHET, P.O.-PAU,  
129 Ludhiana -141004, 2015.
- 130 3. Horticulture Annual Report (2015-16). Directorate of Horticulture, Government of Arunachal  
131 Pradesh, India; 2016.
- 132 4. Dodum T. Supply chain management of apple – A study in Arunachal Pradesh. MBA Thesis  
133 submitted to the University of Agricultural Sciences, Bangalore, Karnataka, India; 2011.

- 134 5. Anonymous. Department of Horticulture, West Kameng district, Government of Arunachal  
135 Pradesh, 2010.
- 136 6. Tsomu S. An economic analysis of apple production in Arunachal Pradesh – A case study of  
137 West Kameng district. Ph.D. Thesis Submitted to Rajiv Gandhi University, Rono-Hills,  
138 Doimukh, Arunachal Pradesh, India; 2016.
- 139 7. Guilford JP. New standards for test evaluation. Educational and Psychological  
140 Measurement. 1964; 6: 427-439.
- 141 8. Mehta P. (1958). A study of communication of agricultural information and the extent of  
142 distortion occurring from district to village level workers in selected IADP districts. Ph.D.  
143 Thesis, Submitted to University of Udaipur, Rajasthan, India; 1958.
- 144 9. Reddy PN, Lakshmi T, Prasad, SV. Standard test to measure knowledge of cotton farmers on  
145 health hazards of pesticides usage in Kurnool district of Andhra Pradesh. 2014; 7(5): 24-29.
- 146 10. Sureshverma R, Samuel G, Rao SI, Qudsiyajamal K. Construction of knowledge test to  
147 measure the paddy growers knowledge on recommended crop production package of  
148 practices in Tamil Nadu state. International Journal of Current Advanced Research. 2017;  
149 6(5): 3867-3871.
- 150 11. Kebede B, Amare G. Measurement of knowledge of farmers on chickpea demonstration at  
151 Adola Rede district, Guji Zone, Oromia regional state, Ethiopia. Journal of Agricultural Science  
152 and Food Research. 2018; 9(3): 1-6.
- 153 12. Kumari NK, Husain AS. A standardised knowledge test to measure the extent of knowledge of  
154 agricultural extension personnel on m-tools. 2016; 28(1): 5614-5619.
- 155 13. Kumar GA, Sailaja V, Satyagopal PV, Prasad SV. Construction and standardization of  
156 knowledge test to measure the knowledge level of farmers on SRI technology. Indian  
157 Research Journal of Extension Education. 2015; 15(4): 161-166.
- 158 14. Barua S. Impact assessment of IARI technologies on farming community in Uttar Pradesh.  
159 Ph.D. Thesis, Submitted to the Faculty of Post-Graduate School, Indian Agricultural Research  
160 Institute, New Delhi, India; 2015.
- 161 15. Dympep A, Singh RJ. A test to measure knowledge of farmers on mitigation and adaptation  
162 practices of climate change in hill agricultural system. International Journal of Agricultural  
163 Science and Research. 2017; 7(1): 21-28.
- 164 16. Archana P, Reddy MJM, Rao IS, VidyaSagar GECh. Construction of knowledge test to  
165 measure the knowledge of watershed farmers towards natural resource management  
166 practices. International Journal of Current Microbiology and Applied Sciences. 2017; 6(9): 81-  
167 89.
- 168 17. Srinivas A, Rani VS, Archana P. Construction of Knowledge Test to Measure the Knowledge  
169 of Agriculture Officers on IPM, INM and IWM Practices. Global Journal for Research Analysis.  
170 2017; 3(1): 1-3.
- 171