



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

**Bai Koyu^{1*}, Rajkumar Josmee Singh¹, L. Devarani¹, Ram Singh¹
and L. Hemochandra¹**

¹*School of Social Sciences, College of Post Graduate Studies in Agricultural Sciences, Central Agricultural University, Meghalaya, 793 103, India.*

Authors' contributions

This work was carried out in collaboration among all authors. Authors BK and RJS designed the study, wrote the protocol, performed the statistical analysis, managed the analyses of the study and wrote the first draft of the manuscript. Authors LD, RS and LH supervised the work, managed the literature searches and edited the manuscript. All authors read and approved the final manuscript.

Article Information

DOI: 10.9734/CJAST/2019/v34i130116

Editor(s):

(1) Prof. Sait Engindeniz, Department of Agricultural Economics, Faculty of Agriculture, Ege University, Turkey.

Reviewers:

(1) Joseph Honore Nguetti, University of Nairobi, Kenya.

(2) John Walsh, School of Business and Management, Vietnam.

Complete Peer review History: <http://www.sdiarticle3.com/review-history/47948>

Original Research Article

Received 07 January 2019

Accepted 19 March 2019

Published 30 March 2019

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.

1. INTRODUCTION

Apple (*Malus domestica*; family-Rosaceace) 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.

2. MATERIALS AND METHODS

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

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

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

3. RESULTS AND DISCUSSION

3.1 Preliminary Administration of Test

Items were pretested in Ramalingam village under Singchung Circle of West Kameng District

and administered to 30 randomly selected apple growers. Score was given as '1' for right and 0 for wrong answer for each of the 32 items. The total accurate response was the knowledge score obtained by an individual farmer. The farmers were then distributed into 6 groups (G1 to G6) each consisting of 5 farmers. The farmers in each group were arranged in plummeting order according to the scores obtained by them. Only four extreme groups with high and low scores were ruminated for calculation of item difficulty and item discrimination indices.

3.2 Item Analysis

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

3.3 Item Difficulty Index (Pi)

The difficulty index of an item was defined as the proportions of apple growers giving precise

responses to that particular item. This was calculated by the formula:

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

Where,

- P_i = Difficulty index in percentage of the ith item.
- n_i = Number of apple growers giving correct response to ith item.
- N_i = Total number of apple growers to whom ith item was administered

3.4 Item Discrimination Index

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

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

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

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	73.33	0.4	S

Item No.	Statements	DI	Disc. Index	S= Selected item and R = Rejected item
9.	of land? 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
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

Item No.	Statements	DI	Disc. Index	S= Selected item and R = Rejected item
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

3.5 Selection of Items for Test

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

3.6 Reliability

The reliability of knowledge test being developed was tested by using Split-Half method: The coefficient of correlation between two sets of scores was calculated and found to be 0.701 was significant at 1% level thus indicating that the internal consistency of the knowledge test developed for the study was relatively high. Knowledge test developed for cotton farmers on health hazards of pesticides usage included 26 item statements as indicated by [9] Knowledge test constructed on package of practices of paddy comprised of 35 item statements as reported by [10]. Knowledge test developed for farmers on chickpea demonstration consisted of 15 item statements in the final selection as signposted by [11]. Knowledge test constructed for agricultural extension personnel on m-tools contained 14 item statements in final selection as stated by [12]. Knowledge test constructed for farmers on SRI technology encompassed of 33 item statements as indicated by [13]. Knowledge test on vegetable farming (cauliflower and carrot) comprised of 11 items as stated by [14]. Out of aggregate 55 items, 20 items were finally selected where 8 items represented knowledge on mitigation practices and 12 items on adaptation practices of climate change [15]. Knowledge test on natural resource management practices comprised of 30 items as stated by

[16]. Out of 46 items on knowledge test developed for IPM, INM and IWM Practices, 28 items were selected in the final format as stated by [17].

4. CONCLUSION

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

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Government of India, Ministry of Agriculture & Farmers Welfare Department of Agriculture, Cooperation & Farmers Welfare, Horticulture Statistics Division. Horticultural Statistics at a Glance; 2017.
2. Jha SN, Vishwakarma RK, Ahmad T, Rai A, Dixit AK. Report on Assessment of Quantitative Harvest and Post-Harvest Losses of Major Crops/Commodities in India. ICAR-All India Coordinated Research Project on Post-Harvest Technology, ICAR-CIPHET, P.O.-PAU, Ludhiana -141004; 2015.
3. Horticulture Annual Report (2015-16). Directorate of Horticulture, Government of Arunachal Pradesh, India; 2016.

4. Dodum T. Supply chain management of apple – A study in Arunachal Pradesh. MBA Thesis submitted to the University of Agricultural Sciences, Bangalore, Karnataka, India; 2011.
5. Anonymous. Department of Horticulture, West Kameng district, Government of Arunachal Pradesh; 2010.
6. Tsomu S. An economic analysis of apple production in Arunachal Pradesh – A case study of West Kameng district. Ph.D. Thesis Submitted to Rajiv Gandhi University, Rono-Hills, Doimukh, Arunachal Pradesh, India; 2016.
7. Guilford JP. New standards for test evaluation. Educational and Psychological Measurement. 1964;6:427-439.
8. Mehta P. A study of communication of agricultural information and the extent of distortion occurring from district to village level workers in selected IADP districts. Ph.D. Thesis, Submitted to University of Udaipur, Rajasthan, India; 1958.
9. Reddy PN, Lakshmi T, Prasad, SV. Standard test to measure knowledge of cotton farmers on health hazards of pesticides usage in Kurnool district of Andhra Pradesh. 2014;7(5):24-29.
10. Sureshverma R, Samuel G, Rao SI, Qudsiyajamal K. Construction of knowledge test to measure the paddy growers knowledge on recommended crop production package of practices in Tamil Nadu state. International Journal of Current Advanced Research. 2017;6(5): 3867-3871.
11. Kebede B, Amare G. Measurement of knowledge of farmers on chickpea demonstration at AdolaRede district, GujiZone, Oromia regional state, Ethiopia. Journal of Agricultural Science and Food Research. 2018;9(3):1-6.
12. Kumari NK, Husain AS. A standardised knowledge test to measure the extent of knowledge of agricultural extension personnel on m-tools. 2016;28(1):5614-5619.
13. Kumar GA, Sailaja V, Satyagopal PV, Prasad SV. Construction and standardization of knowledge test to measure the knowledge level of farmers on SRI technology. Indian Research Journal of Extension Education. 2015;15(4):161-166.
14. Barua S. Impact assessment of IARI technologies on farming community in Uttar Pradesh. Ph.D. Thesis, Submitted to the Faculty of Post-Graduate School, Indian Agricultural Research Institute, New Delhi, India; 2015.
15. Dympep A, Singh RJ. A test to measure knowledge of farmers on mitigation and adaptation practices of climate change in hill agricultural system. International Journal of Agricultural Science and Research. 2017;7(1):21-28.
16. Archana P, Reddy MJM, Rao IS, Vidyasagar GECh. Construction of knowledge test to measure the knowledge of watershed farmers towards natural resource management practices. International Journal of Current Microbiology and Applied Sciences. 2017; 6(9):81-89.
17. Srinivas A, Rani VS, Archana P. Construction of Knowledge Test to Measure the Knowledge of Agriculture Officers on IPM, INM and IWM Practices. Global Journal for Research Analysis. 2017;3(1):1-3.

© 2019 Koyu et al.; This is an Open Access article distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0>), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

Peer-review history:

The peer review history for this paper can be accessed here:
<http://www.sdiarticle3.com/review-history/47948>