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Development of a Test to Measure the Knowledge Level of Small Tea Growers on Scientific Tea Cultivation Practices

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Authors' contributions

This work was carried out in collaboration among all authors. Author SP designed the study, performed the statistical analysis, wrote the protocol and wrote the first draft of the manuscript. Author PKD managed the analyses of the study. Authors IB, KB and SS managed the literature searches. All authors read and approved the final manuscript.

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ABSTRACT

The present study was conducted to construct and standardize a test to measure the knowledge level of small tea growers on scientific technology on tea cultivation. The major steps followed for developing the test were construction of items, primary and final selection of items through difficulty index, discrimination index and biserial correlation. The final test comprised of 24 objective questions, referred to as items. The procedure adopted in the study can also be followed for developing knowledge test on any other aspect.

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1. INTRODUCTION

Tea is considered as a true stimulant which satisfies the palate demand of human beings for centuries. Tea is one of the oldest and well organized industries in India and it plays an important role in the national economy. India is the second largest producer of tea in the world after China. Within the tea producing countries, the small tea growers play an important role world-wide. In India, around 160000 small-holders account for over 26 per cent of its production of 1116 million kg. Moreover, there has been an enormous growth of small growers as compared to the large-scale organized sector in the past three decades. The advent of a large number of small tea growers in recent years is a significant development in the tea industry and socio-economic sphere of Assam. At present, in addition to existing big and large tea gardens owned by both Indian and multinational companies, the profession of tea plantation in the state has been taken up by common man as business venture especially by unemployed youths. There are 1, 18,832 small tea growers spread across the state and their cultivation area is estimated at 2.50 lakh hectares.

The small tea growers in Assam are now an economic force for the state. At present small tea growers in Assam produce more than 882 million kilograms of green leaves and the small plantation sector provides self-employment to more than one lakh educated youth. Knowledge is considered to be an essential tool, which enables growers in decision making to embrace the recommended tea cultivation practices to make tea growing more lucrative and viable. An analysis of the knowledge level of small tea growers on scientific tea cultivation practices is considered important to the subject of development of the small tea growers as well as improving the productivity of tea on small holdings. It is also expected that the findings on knowledge level of growers on scientific tea cultivation practices would be of some help to planners, policy makers, research workers and extension functionaries in preparation of blue print for developing knowledge of growers on scientific tea cultivation practices leading to improved productivity of tea on small holdings. A study conducted by Sarkar et al. [1] on constructing a knowledge test to measure the knowledge level of farmers about climate change in arid ecosystem of India revealed that most of the respondent (73%) knew that maturity period of major crop is reducing due to climate change. Similarly majority of farmers (61%) knew about the impact of global warming on sea level and 86% respondents had knowledge about the impact of climate change in arid ecosystem. A study conducted by Borah [2] revealed that majority of respondents (59.17%) had medium level of knowledge, whereas 23.34 per cent and 18.33 per cent of farmers had low and high level of knowledge about vegetable farming, respectively. Parkash and Rajinder [3] opined that knowledge is one of the important components of behavior and as such it plays an important role in the covert and overt behavior of an individual. Bai et al. [4] opined that study of knowledge of apple growers helped in understanding about prominence of promoting scientific cultivation practices of by the growers as well as help to bond the knowledge gap between the farmers and researchers. Blomm [5] defined knowledge as “those behaviour and test situations which emphasized the remembering either by recognition or by recall of ideas, material or phenomena.” English and English [6] conceptualized knowledge as “a body of understood information possessed by an individual or by a culture”. In this study, knowledge was conceptualized as the ideas, information or phenomena included in the test as items or questions for measuring the knowledge level of the small tea growers on scientific tea cultivation practices. Keeping these facts in view, a study was carried out to construct and standardize a test to measure the knowledge level of growers on scientific practices of tea cultivation.

2. MATERIALS AND METHODS

This research work was undertaken under a M.Sc. (Agri) research project which was conducted in Sonitpur district of Assam with an objective to assess the level of knowledge of small tea growers on scientific practices of tea cultivation. The district had three agricultural sub-divisions, out of which two sub-divisions namely, Biswanath and Tezpur were selected randomly for the study. A list of small tea growers for each of the selected sub-divisions was prepared with the help of office of the Tea Board of India located at Biswanath Chariali and Small Tea

Growers Associations of the district. Then from each of the selected sub-divisions, 50 small tea growers were selected at random, thus making the total sample size of 100 small tea growers. Only those small tea growers who had a minimum of 1 ha of land under tea cultivation were considered for inclusion in the sample of the study.

As no standardized test was available for measuring the knowledge of small tea growers, an attempt was made to develop and standardize a test to measure the level of knowledge of small tea growers on scientific practices of tea cultivation. The procedure suggested by Das [7] was followed in construction of the knowledge test which is described in the following paragraphs.

2.1 Preliminary Selection of Items for Knowledge Test

A total of 55 numbers of objective questions, referred to as items, were collected by consulting the books 'Field Management in Tea' published by Tea Research Association, Tocklai Experimental Station, Jorhat, Assam and 'Baigyanik Vittit Chahkheti' (Scientific Cultivation of Tea) authored by Dr. G. K. Saikia, Extension specialist (Tea) and Dr. M. Taparia, Programme Co-ordinator, Small Tea Growers Advisory Programme, Department of Tea Husbandry & Technology, AAU, Jorhat, Assam. The important factor considered in collecting the items for the knowledge test was to determine and classify the object to be measured by it. After collection of items, they were subjected to scrutiny by a panel of expert. The preliminary selection of items was then made for the raw knowledge test on the basis of following criteria as suggested by Bhalara and Halyal [8].

i. Response to the items should promote thinking rather than rote memorizing.
ii. The items should differentiate the well informed farmers from less informed ones.
iii. The items should cover all the important areas of knowledge about climate resilient agro-technologies.
iv. The items should have fairly difficulty values [9].

In light of the above criteria, 38 items were selected to include in the raw knowledge test battery. Before editing of items, they were framed in the form of objective type questions having correct or incorrect type of answer.

2.2 Item – Analysis

To analysis 38 items included in the raw knowledge test, they were administered to a group of 30 small tea growers selected at random in a non-sampled area of Jorhat district of Assam. Their responses were quantified by giving a score of one to correct answer and zero to an incorrect answer. After computing the total scores obtained by the growers on the raw test, they were divided into six equal groups arranged in descending order of total scores. These six groups were labeled as G_1, G_2, G_3, G_4, G_5 and G_6 respectively with five respondents in each group. For the purpose of items analysis, the middle two groups were eliminated keeping four extreme groups with high and low scores. The items for the final knowledge test battery were selected on the basis of the following three indices.

i. Items difficulty index (P)
ii. Item discrimination (E1/3)
iii. Biserial correlation co-efficient (r_b)

i. Item difficulty index (P)

This index was used to find out the extent to which an item was difficult to answer by the respondent. The value of P was expressed in terms of percentage of correct responses obtained for a particular item and worked out as follows:

$$P = \frac{\text{number of respondents giving correct answer}}{\text{total number of respondents}} \times 100$$

The items with P values ranging from 20 to 85 were considered for the final knowledge test.

ii. Item discrimination index (E1/3)

The function of item discrimination index, $E_1/3$ was to find out whether an item really discriminates a well-informed farmer from a poorly-informed one. To calculate the values of $E_1/3$, the following formula was used.

$$E1/3 = \frac{(S_1 + S_2) - (S_5 + S_6)}{N/3}$$

Where,

S_1, S_2, S_5, S_6 = frequencies of correct answers in groups G_1, G_2, G_3 and G_6 respectively.

N= total number of respondents in the item analysis.

The items with discrimination index values ranging from 0.20 to 0.80 were included in the final knowledge test.

iii. Biserial correlation

The biserial correlation was used for the test of item validation when the criterion of validity was regarded as internal consistency, that is, relationship of the total score to a given item. The co-efficient of biserial correlation (r_b) was calculated for each item by using the following formula [10].

$$r_b = \frac{\overline{Xp} - \overline{Xq}}{St} \times \frac{pq}{Z}$$

Where,

r_b = biserial correlation co-efficient
$\overline{Xp}$ = mean of x values for the higher group in the dichotomized variable.
$\overline{Xq}$ = mean of x values for the lower group in the dichotomized variable.
P = proportion of cases in the higher group.
Q = proportion of cases in the lower group.
Z = Ordinate of the unit normal curve at the point of division between segments containing p and q proportion of the cases.
S_t= standard deviation of the total sample in the continuously measured variable.

The items with biserial correlation co-efficients (r_b) significant at 5 per cent probability level were selected for the final knowledge test.

2.3 Reliability and Validity of the Test

The reliability of the test was estimated with the help of split-half method (odd-even design) by applying the following formula [11].

$$r_{tt} = 1 - \frac{S_d^2}{S_t^2}$$

Where,

r_{tt} stands for reliability coefficient of the total test scores, d is the difference between two half scores, S_d is the standard deviation of those differences and S_t is the standard deviation of total test scores.

The intrinsic validity of the test was estimated by taking the square root of the reliability coefficient [12].

2.4 Method of Administration

The knowledge level of a respondent on scientific practice of tea cultivation was indicated by the total score received by him/her on the test. The answers for the question in the knowledge test were in dichotomous categories. In computing the knowledge scores of the respondents, correct answer to a question was given one score and for incorrect answer was given zero score. The total score on the test had a theoretical range of 0 to 24.

3. RESULTS AND DISCUSSION

Based on the results of item analysis, 24 items were retained for inclusion in the final knowledge test. The final version of the test with values of P, E1/3 and r_b for different items are presented in Table 1. An examination of the items included in the final knowledge test reveals that they pertain to different aspects of scientific tea cultivation practices. This indicates good representativeness of the test items. The coefficient of reliability and coefficient of intrinsic validity of the instrument were found to be 0.80 and 0.92 respectively, which indicated that test was dependable or stable as the measuring instrument.

The values of difficulty index (P) of items of the final knowledge test ranged from 33.33 to 83.30 per cent. Similarly, the values of discrimination index (E1/3) of items of the final knowledge test ranged from 0.30 to 0.70. The magnitudes of co-efficient of biserial correlation (r_b) of items of the test ranged between 0.43 and 0.89. It was observed that items constructed to test the knowledge on scientific practices of tea cultivation were reasonably stable and dependable for measurement of knowledge level of small tea growers. In addition, the findings of item analysis revealed that majority of respondents owned moderate level of knowledge on scientific practices of tea cultivation. The findings of the study are supported by the findings of Das [13], Sultana [14], Borah [2] and Kebede and Amare [15].

Table 1. Final knowledge test with values of difficulty index, discrimination index and co-efficients of Biserial correlation

Sl. no.	Items	Difficulty index (P)	Discrimination index (E1/3)	Biserial correlation Co-efficient (r_b)
1.	What are the planting materials used for tea cultivation?	63.33	0.60	0.61
2.	What type of soil is suitable for planting of tea?	73.33	0.30	0.75
3.	What are the methods of planting of tea?	76.66	0.50	0.61
4.	What should be the spacing of planting of tea	76.66	0.30	0.81
5.	What should be the depth for field drain in tea plantation?	63.30	0.30	0.83
6.	What are the compositions of Young Tea Dose (YTD)?	76.60	0.70	0.58
7.	Name at least two chemicals that can be used as pre-emergent/post emergent weedicides?	80.00	0.60	0.66
8.	Name at least two tree species that can be used as shade tree in tea plantation?	83.30	0.60	0.86
9.	What is the optimum time period of planting of seedlings in the main field?	83.33	0.40	0.61
10.	Name at least one common disease of tea plants?	73.33	0.60	0.69
11.	What control measures should be taken for above mentioned disease?	76.60	0.70	0.77
12.	Name at least one common insect pest in tea plants?	63.30	0.60	0.48
13.	What control measure should be taken for above mention insect-pest?	23.30	0.20	0.59
14.	Why is it necessary to maintain plucking table in tea plantation?	56.60	0.60	0.83
15.	Name at least two types of pruning done in tea plantation?	80.00	0.30	0.59
16.	What are the methods of propagation used in tea plants?	46.66	0.30	0.57
17.	Name at least two green manuring crops that can be used before tea plantation in the field?	33.33	0.20	0.82
18.	Mention the doses of NPK fertilizers to be applied in mature tea?	50.00	0.50	0.46
19.	Name at least two precautions that should be followed during transportation of green tea leaves from garden to factory?	66.66	0.60	0.43
20.	What measures should be taken for the quality control during plucking?	73.30	0.50	0.89
21.	What materials would you use for soil reclamation in tea cultivation?	83.30	0.30	0.58
22.	What precautions should be taken during storage of green tea leaves before transportation?	43.33	0.30	0.84
23.	What practice should be followed for soil rehabilitation in tea cultivation?	70.00	0.70	0.68
24.	Why infilling is essential in tea cultivation?	76.66	0.60	0.61

4. CONCLUSION

The knowledge test developed in the study can be readily used by researchers as well as extension functionaries dealing with scientific technology of tea cultivation. The test can be suitably translated into vernacular and administered accordingly. The procedure

adopted in the study can also be followed for developing knowledge test on other aspects.

CONSENT

As per international standard or university standard, respondents' written consent has been collected and preserved by the author(s).

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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