**Development of a test to measure the knowledge level of small tea growers on scientific tea cultivation practices**

**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.

**Keywords:** Knowledge, Scientific practices of tea cultivation, Difficulty index, Discrimination index, Biserial correlation co-efficient

## 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. 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.

Bloom (1956) 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 (1958) 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 farmers on climate resilient agro-technologies. Keeping these facts in view, a study was carried out to construct and standardize a test to measure the knowledge level of farmers on Scientific Practices on Tea Cultivation.

## 2. MATERIALS AND METHODS

The study was conducted in Sonitpur district of Assam. 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.

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 (1991) was followed in construction of the knowledge test which is described in the following paragraphs.

### a. 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 (1988).

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. (Singh and Gill, 1988)

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.

**a. 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 $G_{1,}$ $_{G2,}$ $G_{3,}$ $G_{4,}$ $G_5$ 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 (Guilford and Fruchter, 1978).

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

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.

**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 (Rulon, 1939).

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

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 (Guilford, 1978).

**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.

| 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 |

**Table 1. Final Knowledge test with values of Difficulty Index, Discrimination Index and Co-efficients of Biserial correlation**



## 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.

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