Method Article

Construction of a Knowledge Test to assess Rubber Growers' knowledge of Rubber Plantation Development and Extension Schemes in North East India

ABSTRACT

To assess the expertise of rubber growers, a knowledge test was created. The majority of the 37 questions were created by endorsing reasonable thinking above root memorization and to distinguish between competent rubber growers who are less competent. The results of the sample respondents' scores were subjected to item analysis, which included calculating the item difficulty index and the item discrimination index. The scale used for the final selection has 17 items with difficulty indices between 36.66 and 60 and discrimination indices between 0.58 and 0.73. The reliability of the knowledge test under development was examined using the Split-Half method, and it was found to be 0.722.

Aims: To construct a knowledge test to assess rubber growers' knowledge on Rubber Plantation Development and Extension Scheme.
Study design: Descriptive study.
Place and Duration of Study: Karimganj, Assam, between January 2021andDecember 2022.
Methodology:A no.ofitems were collected and 37 items were kept.The majority of the 37 questions were created by endorsing reasonable thinking above root memorization and to distinguish between competent rubber growers who are less competent. 37 questions were pretested to 30 randomrubber growers.
Results The results of the sample respondents' scores were subjected to item analysis, which included calculating the item difficulty index and the item discrimination index.
Conclusion: The scale used for the final selection has 17 items with difficulty indices between 36.66 and 60 and discrimination indices between 0.58 and 0.73. The reliability of the knowledge test under development was examined using the Split-Half method, and it was found to be 0.722.

Keywords: Knowledge test; Rubber growers; difficulty index; discrimination index; reliability.

1. INTRODUCTION

Natural Rubber (NR) from the tree species, *Hevea brasiliens*, is grown in tropical humid climates as a significant commercial plantation crop. The world's top NR producers are Thailand, Indonesia, Malaysia, Vietnam, China, and India. Around 12.40 million tonnes and 12.60 million tonnes of natural rubber are now produced and consumed globally, respectively. China, India, the United States, Japan, Thailand, Indonesia, and Malaysia are the top NR consumers. A vital industrial raw material with unique status for use in defence, national security, and industrial development, rubber is often regarded as such. Major consuming nations maintain natural rubber

strategic reserves. Rubber is a commodity that is traded internationally, and economic growth trends, production in important producing countries, and demand in important consuming nations all have an impact on rubber prices. India is currently the second-largest consumer of NR in the world, producing the sixth-largest amount (775,000 tonnes in 2021-22) and consuming around 1.2 million tonnesyearly[1]. The North Eastern region produced about 94430 tonnes of natural rubber in 2018–19. The average amount of natural rubber produced per hectare in the Northeast is 1206 kg, with Tripura producing the most (1226 kg) and Arunachal Pradesh producing the least (928 kg). This is much lower than the 1472 kg/hectare [2] national average [3]. The scheme Rubber Plantation Development and Extension in North East was conceptualized to accelerate scientifically-guided rubber planting and replanting, the programme seeks to increase natural rubber production in India by giving growers the appropriate technical and financial help[3].

With the right information, growers can make informed choices that will increase the productivity and sustainability of their rubber growing operations. The rubber knowledge test may also make growers more aware of the importance of promoting scientific cultivation practices. It may also bridge the knowledge gap between growers and researchers and the harvest gap between grower's fields and research stations. Thus, it may also help growers raise turnover more quickly and enjoy enhanced livelihood stability, the opportunity to send their kids to a good school, a reliable source of revenue, and less vulnerability [6, 7]. On the basis of this environment, an effort was undertaken to create a knowledge test on Rubber Plantation Development and Extension Scheme for rubber growers in North East India.

2. MATERIAL AND METHODS

Item assortment: The content of knowledge test was composed of questions called items. A number of items were gathered from journals, magazines, books and by discussions with experts which consist of academicians, scientists, researchers, and Rubber Board officials who were familiar with the subject. The questions were designed to test the knowledge level of rubber growers about recommended practices of rubber and about the Rubber Plantation Development and Extension scheme.

Pilot miscellany of items: The selection of questions was based on the following criteria: I It should encourage critical thinking rather than rote memorization; and (ii) It should separate the knowledgeable rubber producers from the uneducated ones and have a credible degree of difficulty. Based on these two techniques, 37 items (27 on recommended practices and 10 on Rubber Plantation Development and Extension scheme), all of which were in objective form (i.e., multiple-choice format), were principally gathered for the design of the knowledge test. Thus, a schedule containing these 37 items was created in order to administer it to the rubber growers and screen out the extraneous items while doing item analysis.

3. RESULTS AND DISCUSSION

Preliminary Administration of Test

In order to pre-test and modify the items, 30 rubber growers were chosen at random. Each of the 37 items received a score of "1" for a correct response and "0" for an incorrect one. An individual grower's knowledge score was the sum of all correct answers. After that, the growers were divided into 6 groups (G1 to G6), each of which contained 5 growers. According to their scores, the growers in each group were put into descending order. For the purpose of determining the item difficulty and item discrimination indices, only four extreme groups with high and low scores were taken into consideration.

Item Analysis

According to Guilford[4],item analysis of a test produces two types of information: item difficulty and item discrimination. The index of item difficulty revealed how challenging an item was, but the index of discrimination described the degree to which an item discriminates between those who are well informed and those who are not.

Item

The percentage of rubber growers who provided accurate answers to a certain item was used to determine that item's difficulty index. The formula used to determine this was:

$P_i = n_i/N_i \times 100$

Where,

P_i = Difficulty index in percentage of the i^{th} item.
n_i = Number of rubber growers giving correct response to i^{th}item.
N_i= Total number of rubber growers to whom i^{th} item was administered.

Item Discrimination Index

The method given by Mehta[5] was used to calculate the discrimination index. The following formula was used to determine the item discrimination index:

$$E^{1}/_{3} = \frac{(S1 + S2) - (S5 + S6)}{N / 3}$$

Where, N = Total Number of rubber growers in the sample of item analysis and S1, S2, S5, and S6 were the relative frequencies of accurate answers in the G1, G2, G5, and G6 groups, respectively.

Selection of Items for Test

In the final configuration of the knowledge exam, two standards; item difficulty index and item discrimination index were computed for a large number of items. The final set-up of the knowledge test in the current study includes items with difficulty indexes ranging from 20 to 93.33 and discrimination indexes ranging from 0 to 0.88. All 37 items' item difficulty index and item discrimination index were calculated, and 17 things that met both criteria were chosen for the final knowledge test configuration, as shown in Table 1.

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
A.	**Knowledge on Rubber Plantation Development**			
1.	Do you know the optimum temperature during the growing season for rubber cultivation?	60	0.46	R
2.	Which of the following is the soil recommended for cultivation of rubber?	36.66	0.66	S
3.	What is the recommended pit size of rubber seedling transplantation?	36.66	0.58	S
4.	What is/are the recommended spacing of rubber cultivation?	46.66	0.79	R
5.	Which of the following number of plants can be grown in 1 ha of land?	46.66	0.79	R
6.	Above what height the side shoots/branches should be kept?	60	0	R
7.	Why capping is done?	43.33	0.58	S
8.	Why application of lime is done in young rubber plantation?	80	0.66	S
9.	What materials are generally used for mulching of rubber plant?	73.33	0.84	R
10.	Which of the following disease is prevalent in North East India?	40	0	R
11.	What is the full form of TPD?	53.33	0.73	S
12.	When tapping/Latex harvesting can be started generally after planting?	70	0.73	S
13.	At what girth size of trees	43.33	0.84	R

Item no.	Statements	DI	Disc. Index	S=Selected item and R=Rejected item
	tapping/Latex harvesting can be done?			
14.	At what height from the bud union tapping is to be started?	50	0.58	S
15.	At what time of the day tapping is to be done?	60	0.79	R
16.	Why marking is necessary?	63.33	0.73	S
17.	What is the slope of tapping?	23.33	0.84	R
18.	When collection of latex should be done?	30	0.73	S
19.	What is DRC?	60	0.58	S
20.	Percentage of DRC in latex?	50	0	R
21.	Which device is used to estimate Dry Rubber Content in latex?	63.33	0.46	R
22.	Which acid is generally used for coagulation in latex processing?	30	0.66	S
23.	How much water is needed for diluting 1 litre of 25% drc latex?	30	0.66	S
24.	Which chemical is added to avoid darkening of sheets?	36.66	0.79	R
25.	Which chemical is added to avoid mould formation on sheets?	46.66	0.88	R
26.	What is the ideal weight of dry sheets?	46.66	0.66	S
27.	What is RSS?	60	0.46	R
B.	**Knowledge on Rubber Plantation development Scheme**			
1.	According to scheme, what are the classifications of rubber growing areas?	30	0.84	R
2.	Who are eligible for the scheme?	60	0.73	S
3.	What is the objective of the scheme?	53.33	0.88	R
4.	When is the submission of applications to be done?	73.33	0.46	R
5.	What are the components of the RPDE Scheme?	40	0.73	S
6.	Which of the following land type is not eligible for the scheme?	93.33	0.46	R
7.	What is 'permit' in the scheme?	36.66	0.58	S
8.	What is the Minimum planted area requirement for the scheme?	63.33	0.73	S
9.	What is the Maximum planted area eligible for the scheme in NE?	20	0.46	R
10.	What is the total Subsidy amount per hectare in ₹ for NE?	43.33	0.79	R

Reliability

The Split-Half method was used to test the reliability of the knowledge test that was being developed. The coefficient of correlation between two sets of scores was calculated and found to be 0.722, which was significant at $P<0.001$ and this indicated that the knowledge test's internal consistency was relatively high.

Content Validity of Knowledge Test

When choosing the final set of questionnaires, care was taken to ensure that they included all relevant behavioral aspects of the respondents' knowledge of recommended practices of rubber and the RPDE scheme. It was assumed that the scores achieved by administering this test had tested the respondents' knowledge as intended because items were gathered from a variety of sources.

4. CONCLUSION

Knowledge of rubber cultivation from a scientific standpoint is crucial for the growth of entrepreneurship. It is also essential for evaluation and devising need-based solutions for the socioeconomic advancement of rubber growers. However, it is rare that there is any such standardized method for evaluating the level of knowledge of rubber growers. A knowledge test scale was created using this circumstantial evidence to consider the knowledge level of the rubber growers. The knowledge test that was developed for measuring the knowledge level of rubber growers was discovered to be exceptionally firm and constant. As a result, only 17 of the 37 total item statements were included in the final knowledge test, which ranged from 0.58 to 0.73.

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