Development of Knowledge Scale with the Recommended Scientific Practices of Maize Cultivation to Measure the Knowledge Level of the Maize Farmers in Sonitpur District of Assam, India

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A B S T R A C T

Maize is the second-most significant crop in Assam, and it is mostly cultivated in rain-fed upland environments. It is currently being used more in some small enterprises due to the fast-growing demand for poultry feeds and fodder in Assam. Due to the lack of a suitable scale to measure the knowledge of maize farmers on the scientific practices of maize cultivation in Sonitpur district of Assam, it was necessary to construct a knowledge test for the purpose. Relevant areas that covered the major aspects of maize cultivation practices were included. After the experts opinion on the items, the difficulty index, discrimination index and biserial correlation were worked out. For administering the knowledge test, a respondent was given one mark for each correct answer and zero mark for each wrong answer.

Introduction

The mainstay of Assam's economy is agriculture. Approximately 3 crores of the state's people, or about 89 percent, reside in rural areas, and 70 percent of the workers are employed in agriculture and related industries. In terms of area and productivity, maize is the third most significant cereal crop in the world, behind wheat and rice. Although productivity is far lower than that of other potential maize-growing nations like the USA, Argentina, and China, India is the fifth-largest producer of maize in the world, accounting for 3% of the total production (Kalita *et al.,* 2019). Maize is the second most important crop in Assam, but the production is low due to various reasons like

inadequate rainfall, small operational landholdings, losses due to pest and diseases, low adoption of improved varieties, technologies, low level of knowledge and other management practices by the farmers (Chandana *et al.,* 2022). As knowledge play an important role in increasing the production and productivity of the maize crop similarly it also helps to determine the farmers behaviour (Manhas, 2022).

According to Bloom (1956) "knowledge is that part of behaviour and test situations which emphasize either by recognition or recall of ideas, material, or phenomena". An appropriate measurement tool is necessary in order to evaluate the knowledge level of the farmers (Rajkamal, 2001).

The present study standardized a "knowledge test" to measure quantitatively the knowledge of the maize farmers about the improved maize farming practices. In Sonitpur district of Assam

Materials and Methods

Mode of data collection

The data were collected by the investigator herself using interview schedule which was prepared in English language at the residence or field of the farmers. Questions in the interview schedule were put to the farmers in local Assamese language. Translation work was done instantly by the researcher herself as she was well versed in the local language.

A test was constructed in the present study to measure the respondent's level of knowledge on recommended scientific practices of maize cultivation. The procedure suggested by Das (1991) was followed in the construction of the knowledge test which is described in the following paragraphs.

Preliminary selection of items for knowledge test

A total of 34 number of questions, referred to as items, were collected by consulting the package of practices and bulletins, published by Assam Agricultural University and Department of Agriculture, Govt of Assam. The important factor considered in collecting the items for the knowledge test was to determine and classify the objects 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 made for the raw knowledge test on the basis of following criteria as suggested by Bhalara and Hayal (1988).

Response to the items should promote thinking rather than rote memorizing

The items should differentiate the well-informed farmers from less informed ones.

The items should cover all the important areas of knowledge about recommended package of practice of maize cultivation.

The items should have fairly difficulty values (Singh and Gill, 1988).

In the light of above criteria, 22 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 questions.

Item – analysis

To analyse 22 items included in the raw knowledge test, they were administered to a group of 30 farmers selected at random in a village in the non-sampled area. Their responses were qualified by giving a score of one to correct answer and zero to an incorrect answer. After computing the total scores obtained by the farmer on the raw test, they were divided into six equal groups arranged in descending order of total scores. These six groups were labelled 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 item 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) Item Difficulty Index (P)
ii) Item Discrimination Index ($E_{1/3}$)
iii) Biserial correlation co-efficient (r_b)

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.

Item Discrimination Index ($E_{1/3}$)

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.

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

Where,

S_1, S_2, S_5, S_6 = frequencies of correct answers in groups G_1, G_2, G_5 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.

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, the

relationship of the total score to a given time. The co-efficient of biserial correlation (r_b) was calculated for each item by using the following the following formula (Guildford and Fruchter, 1978).

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

Where,

r_b= biserial correlation co-efficient

Xp= mean of x values for the higher group in the dichotomized variable.

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-efficient (r_b) significant at 5 percent probability level were selected for the final knowledge test.

On the basis of the values of P, $E_{1/3}$ and r_b out of 34 items 22 were selected for the final knowledge test. The findings of the item analysis is presented in Table 2.

Final selection of items for the test

Three criteria *viz.,* item difficulty index, discrimination index and biserial correlation coefficient were considered for selection of items in the final format of the knowledge test which is presented in Table 1.

When a respondent was able to give the answer correctly then the item was considered as less difficult than the individuals ability to cope with it.

For the present study the items with difficulty index values ranging from 20 to 85 and the discrimination index values ranging from 0.20 to 0.80 were included in the final knowledge test.

The Table 2 below indicate the values of Difficulty Index, Discrimination Index and Co-efficient of Biserial Correlation for the items included in the knowledge test.

As well all got to know that knowledge is a very important variable to determine the behaviour as well as the knowledge level of the farmers. Thus, it may be concluded that from set of 34 questions, 22 questions were finally selected through proper consultation and scrutiny by a panel of experts.

The item difficulty index, item discrimination index and the biserial correlation coefficient was used to determine the knowledge level of the farmers. The procedure suggested by Das (1991) was followed in the construction of the knowledge test.

Table.1 Items considered for calculation of the knowledge test

1. Name at least one recommended variety of maize?	Correct/incorrect
2. How much seed is required for one bigha of a land for maize cultivation?	Correct/incorrect
3. What are the different seasons in which maize cultivation can be done?	Correct/incorrect
4. What is the optimum time period for sowing of maize in kharif season?	Correct/incorrect
5. What is the optimum time period for sowing of maize in rabi season?	Correct/incorrect
6. Name at least one chemical that can be used to treat the maize seeds before sowing?	Correct/incorrect
7. What should be the row to row spacing in maize cultivation?	Correct/incorrect
8. What should be the plant to plant spacing in maize?	Correct/incorrect
9. What is the dose of nitrogenous fertilizer that should be applied in 1 bigha of land for maize cultivation?	Correct/incorrect
10. What is the dose of potassium that should be applied in maize?	Correct/incorrect
11. What is the dose of phosphorous that should be applied in maize?	Correct/incorrect
12. At what stages fertilizer should be applied for maize cultivation?	Correct/incorrect
13. What method should be followed for fertilizer application in maize?	Correct/incorrect
14. Name at least one crop that can be intercropped with maize?	Correct/incorrect
15. Name at least one chemical can be applied as a pre- emergent weedicide in maize cultivation?	Correct/incorrect
16. At what stages irrigation should be done in maize cultivation?	Correct/incorrect
17. Name at least one important disease of maize crop?	Correct/incorrect
18. Name at least one important insect pest of maize crop?	Correct/incorrect
19. What is the optimum stage for harvesting of maize cob?	Correct/incorrect
20. What is the optimum moisture content for storing of maize cob?	Correct/incorrect
21. What is the proper method that can be followed for storing the maize cobs?	Correct/incorrect
22. What is the use of plant after harvesting of cob?	Correct/incorrect

Table.2 Values of Difficulty Index, Discrimination Index and Co-efficient of Biserial Correlation for the items included in the knowledge test

Item No.	Difficulty Index (P)	Discrimination Index (E1/3)	Biserial Correlation Co-efficient (rb)
1	63.33	0.60	0.61
2	73.33	0.30	0.75
3	76.66	0.50	0.61
4	76.66	0.30	0.81
5	63.30	0.30	0.83
6	76.60	0.70	0.58
7	80.00	0.60	0.66
8	83.30	0.60	0.86
9	83.33	0.40	0.61
10	73.33	0.60	0.69
11	76.60	0.70	0.77
12	63.30	0.60	0.48
13	23.30	0.20	0.59
14	56.60	0.60	0.83
15	80.00	0.30	0.59
16	46.66	0.30	0.57
17	33.33	0.20	0.82
18	50.00	0.50	0.46
19	66.66	0.60	0.43
20	73.30	0.50	0.89
21	83.30	0.30	0.58
22	43.33	0.20	0.84

The items with difficulty index values ranging from 20 to 85 and discrimination index values ranging from 0.20 to 0.80 were included in the final knowledge test. Therefore, the knowledge test was fruitful to determine the knowledge level of the maize farmers in Sonitpur district of Assam.

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