



Knowledge Test for Rainfed Farmers on Natural Resource Management Practices

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ABSTRACT

Natural resource management (NRM) aims on efficient and sustainable utilization of natural resources. One of the greatest challenges facing the world is meeting the rising demand for food with a sustainable natural resource base. Agriculture, a sector being dependent on natural resources, it is high time to make farmers aware on the importance of NRM which require measuring the knowledge level of farmers on NRM practices for the better dissemination of NRM technologies. The study attempted to construct a knowledge test to measure the knowledge level of rainfed farmers during 2021. Items about NRM were collected from relevant literature and through consultation with experts. One pilot study was conducted in Lingaipalle village of Mahabubnagar district of Telangana for item analysis during September 2021. Item analysis provided item difficulty index, item discrimination index and item validity index. Based on the criteria, a total of 18 items were selected in the final test. To administer the knowledge test, one mark for each correct answer and zero mark for each wrong answer was assigned. Finally, the reliability of the test using split-half method found to be 0.749 indicating that the knowledge test is highly reliable for the present study.

INTRODUCTION

One of the greatest challenges facing the world is meeting the rising demand for food with a sustainable natural resource base. Agriculture, a sector being dependent on natural resources, it is high time to make aware farmers on the importance of natural resource management. To address the increasing concerns about degradation of natural resources and the sustainability of agricultural production potentials, various national and international organisations have initiated research and development programmes for Natural Resource Management (NRM). Natural Resource Management aims on efficient and sustainable utilization of natural resources. Efforts in this direction include the development and dissemination of low-cost technological options ensuring integrated management of both soil and water resources, the development of ecologically sound and sustainable cropping systems and options

for the conservation and management of natural resources. In many regions lack of technological awareness and increasing food demand are taking a heavy toll on the productive resource base. Major challenges in agriculture include water scarcity and soil degradation coupled with less productivity of crops. Studies shows that there is a link between poverty and environmental degradation. Moreover, degradation of resource base adversely affects the capabilities of the community and further increases their vulnerabilities to various risks such as drought, flood etc. There is a strong nexus between sustainable production and natural resource management. Hence, strategies to enhance the livelihood security of the farmers should address the ways to enhance the productivity of their natural assets. At the same time, technology transfer to be more efficient, it is very much important to understand the existing knowledge level of farmers on NRM practices and to quantify them for the better dissemination of

NRM technologies. Effective adoption of NRM practices can only be achieved if farmers have sufficient knowledge on NRM practices. Dympep & Singh (2017) developed a test to measure knowledge of farmers on mitigation and adaptation practices of climate change in hill agricultural system. Similarly, Srinivas et al., (2014, 2019) constructed knowledge test to measure the knowledge of agriculture officers on IPM, INM and IWM practices and to measure the level of knowledge of tribal farmers on seed banking respectively. Archana et al., (2017) constructed knowledge test to measure the knowledge of watershed farmers towards natural resource management practices. But so far, a very few studies have been conducted in this line. With this background, the present study has been made an attempt to construct a standardized knowledge test on NRM practices to measure the knowledge level of rainfed farmers. According to Roy & Mondal (2004), a knowledge test is a set of questions, each of which has a correct answer, to which people respond. In this study, knowledge has been defined as the understanding of the farmers about the NRM practices, its importance and practical knowledge based on their experience. Construction of such knowledge test by using scientific procedure will help to know the existing knowledge gap among the farmers and adopt suitable extension strategies based on their knowledge level.

METHODOLOGY

Standard methodology used by Sarkar et al., (2014) & Priyadarshni et al., (2020) was followed in this study to develop the knowledge test on natural resource management practices. Similar procedure was followed by Kumar et al., (2016); Kaur et al., (2020); Vijayan et al., (2022) to develop knowledge test. The test consisted of following steps - item collection, relevancy test using jury opinion, item analysis based on difficulty and discriminatory index and reliability test. Items about natural resource management with a special focus on water management and farm implements and machinery were collected from relevant literature, consultation with experts in concerned subjects and pilot studies conducted in the area of investigation. A total of 42 items were selected covering most of the aspects related to NRM. Necessary care was taken to check that the selected items were based on the knowledge that farmers possess. Items were subjected to scrutiny by an expert panel of judges to determine the relevancy and screening for inclusion in the final test (Kline, 1986). Total forty-two items were sent to forty experts in concerned subjects. The experts were asked to judge the relevancy of test items, their difficulty level and content validity of each test item. The relevancy of test item was judged on a five-point continuum from most relevant (5) to not at all relevant (1). Finally, 26 items were selected whose mean relevancy score is above 2.5. One pilot study has been conducted in Lingaipalle village of Mahabubnagar district of Telangana for the item analysis. For this, sixty respondents were selected randomly. Item analysis provided following

information- item difficulty index and item discrimination index. Item difficulty index is defined as the proportion of farmer respondents giving correct answer to that particular item. Here underlying assumption is that difficulty is linearly related to the level of respondents' knowledge about the subject. The difficulty level is calculated using the following formula:

$$P_i = n_i/N$$

Where, P_i = Difficulty index for i^{th} item
 n_i = Number of respondents correctly answered the i^{th} item
 N = Total number of respondents to which i^{th} item were administered

Further, the discrimination power of all the items are worked out using $E^{1/3}$ method to find out the item discrimination. In this method, respondents are divided into six equal groups, each having ten respondents and they are arranged in descending order of their magnitude of their knowledge scores as obtained from them. The middle two groups are eliminated. Only four extreme groups i.e. the groups with highest and lowest scores are considered in order to calculate the 'Discrimination Index'.

The following formula is employed to calculate item discrimination index.

$$E^{1/3} = \frac{(S_1 + S_2) - (S_5 + S_6)}{(N/3)}$$

Where, S_1, S_2, S_5 and S_6 are the frequencies of correct answers in G_1, G_2, G_5 and G_6 respectively and N = Total number of farmers in the sample of the item analysis.

RESULTS AND DISCUSSION

The relevancy of test through jury opinion resulted in the selection of 26 items whose mean relevancy score is above 2.5 and these items are further administered to 60 respondents who are not included for the final study. To administer the knowledge test to a respondent, one mark for each correct answer and zero mark for each wrong answer is assigned. Thus, maximum possible score is 26 and minimum is zero. The score obtained by 60 respondents are summed up and arranged in descending order to divide them in 6 equal groups with 10 respondents each. The range of the score of 6 groups are presented in the Table 1. For the purpose of further item analysis, out of six groups the middle two groups are eliminated.

Item analysis was done by determining item difficulty index and discrimination index. Here, the items with difficulty index score between 0.3 to 0.95 and discriminatory value of more than 0.25 were selected for final test based on the recommendation of Althouse (2000) and presented in Table 2. If the difficulty index value is more, it implies that the item is very easy to answer. If more number of farmers is answering the item correct, this item cannot provide distinguishing information between farmers who are knowledgeable on the content versus those who are not.

Table 1. Range of scores obtained by the respondents (G1= Group 1, ... G6= Group 6)

Group Number	G1	G2	G3	G4	G5	G6
Score range	2-5	6-8	9-10	11-12	13-15	16-23
Number of Respondents	10	10	10	10	10	10

Table 2. Difficulty index, Discrimination index of test items

S.No. Items	P _i	E ^{1/3}
1 Are you aware about different farm implements and machinery suitable for rainfed agriculture	0.8	0.45
2 Do you think that the yield will be enhanced if you use various implements and machinery	0.775	0.525
3 Do you think that the expenditure in farming will be more if you use different farm implements	0.75	0.45
4 Do you know that farm implements and machinery are important interventions for timely completion of farm operations	0.725	0.525
5 Find the odd one among the following a) 6-Row planter b) Mini dal mil c) Castor sheller d) Groundnut stripper	0.225 ^x	0.375
6 Do you know about various rain water harvesting structures for enhancing water storage capacity at farm level	0.725	0.525
7 Do you think that the same yield will be obtained even if you judiciously use water	0.725	0.675
8 Do you know that drought tolerant varieties help in achieving optimum yield despite of less rainfall	0.55	0.75
9 Do you know that farm ponds are one of the most important water harvesting structure in rainfed areas	0.725	0.825
10 Do you know that desilting and widening of farm ponds are important for improving water storage capacity	0.275 ^x	0.225 ^x
11 Are you aware that desilting and widening of catchment channels will improve water storage capacity	0.25 ^x	0.15 ^x
12 Find the odd one a) Sprinkler irrigation b) Drip irrigation c) Farm Pond	0.3	0.45
13 Are you aware of different micro irrigation methods	0.325	0.375
14 Do you know that drip irrigation helps in saving water & obtaining higher yield	0.35	0.45
15 Do you know that drip irrigation helps in reducing labour cost	0.275	0.225 ^x
16 Do you think that installation of drip irrigation is expensive	0.625	0.975
17 Do you think that the maintenance of drip system is very difficult	0.6	0.9
18 Have you heard the term watershed	0.175 ^x	0.225 ^x
19 Are you aware about contingency plans in agriculture	0.325	0.375
20 Do you know that horse gram is suitable crop for rainfed areas	0.375	0.525
21 Are you aware about different varieties developed by ICAR-CRIDA	0.425	0.375
22 Whether in-situ moisture conservation and contour cultivation can improve the yield of crops	0.375	0.225 ^x
23 Do you think lifesaving irrigation from water harvesting structure during prolonged dry spells can increase the yield considerably	0.4	0.75
24 Whether mulching in field can retain more soil moisture	0.275 ^x	0.225 ^x
25 Do you think that timely sowing of plants will give better yield	0.375	0.675
26 Do you think that row to row and plant to plant spacing enhances crop yield	0.175 ^x	0.375

Similarly, if the value is less implying that it is very difficult to answer by the farmers. Finally, the item number 1, 2, 3, 4, 6, 7, 8, 9, 12, 13, 14, 16, 17, 19, 20, 21, 23 and 25 were selected based on their respective difficulty index and discriminatory power. Thus, a total of 18 items are selected in the final knowledge test. Then another pilot study is conducted to determine the reliability of the test. Split-half method is used to find the reliability of the knowledge test developed for the study. In this method, all the 18 items are first randomly arranged and then divided into two equal halves with one set containing the odd items and the other set containing the even items. Further, co-efficient of correlation between two sets of scores is calculated and is found to be reliant with a r value of 0.749 indicating that the knowledge test is highly reliable for the present study.

CONCLUSION

Awareness and knowledge about the technology significantly contribute towards the effective transfer of technologies and understanding the knowledge level of farmers is also very important as it influences the adoption of technologies to a great extent. A reliable and valid knowledge test is required to measure the knowledge level of individual farmers. In the present study a knowledge test on natural resource management practices is developed and standardized. Better knowledge on NRM practices are critical inputs in farming activities in rainfed areas. The knowledge test developed in this study could be used for assessing the knowledge level of farmers on NRM practices across the country. Knowledge test is essential to identify the lacunae existing in the technology transfer programs. Further, this knowledge test

can pave a way for planning need-based training for the farmers by addressing the existing knowledge gap.

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