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Construction of Knowledge Test to Measure the Knowledge of Watershed Farmers towards Natural Resource Management Practices

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A B S T R A C T

Day by day the natural resources which are highly essential in agriculture like water, land, animal, vegetation are being degraded, eroded and dwindling. It is high time that the farmers should be sensitized and empowered to judicially utilize these resources. Management of natural resources beyond watershed areas, particularly in irrigated areas, is equally important. In fact, all the natural resources and the veritable water regimes – irrigated and arid, semi-arid and wet rainfed areas are all interlinked and interdependent. Due to the non-availability of a proper test to measure the knowledge of watershed farmers towards Natural Resource Management practices, it was thought necessary to construct a test for the purpose. The study mainly contemplates to find out the knowledge of watershed farmers towards natural resource management practices. Keeping this in view, an attempt has been made to develop a test for measuring the knowledge of watershed farmers towards Natural Resource Management practices. Pertinent items were collected covering all aspects of Natural Resource Management practices. After getting jury opinion on the items of test index of item difficulty, index of item discrimination and index of item validity were worked out. To administer the knowledge test a respondent is given one mark for each correct answer and zero mark for each wrong answer. Thirty items were finally selected from 60 items.

Introduction

Natural Resources are the basic support system of life on Earth. Natural resources around the world are degrading and there is a great need to manage the common pool resources well. Livelihood of hundreds of millions of people, especially the rural poor will be seriously jeopardized.

Sustainable development of the society critically depends on natural resources and their management. Natural resources must be used in a way that meets today's needs, while conserving them for future generations. That will require action to develop capacities, from global to farm level, for their sustainable management and regulation (Berjesh and Ajay 2009, Reddy 1996).

Watershed development involves conservation, regeneration, and judicious utilization of natural resources. It aims to bring about an optimum balance between the demand and use of natural resources so that they remain sustainable over time. (Rao 1988, Chandran, 1991 and Doli, 2006.)

Knowledge was operationalised as extent of information known or possessed by the watershed farmers on selected NRM practices

Materials and Methods

Collection of items

The content of the test was composed of questions called items. A comprehensive list of knowledge questions on NRM practices in the study area were prepared by consulting officers of state department of Agriculture, officials of DWMA, books and discussion with agronomists, soil scientists and extension personnel of the University of Agricultural Sciences working in the study area.

Selection of items

The selection of items was done on the basis of the following criteria.

Response to items should promote thinking than routine memorization

They should differentiate the well informed watershed farmer from less informed and should have certain difficulty value.

The items included should cover all areas of knowledge about NRM practices.

By using above criteria, 60 items were selected for developing knowledge test, after editing carefully and by subjecting them to expert's endorsement. The experts consists Extension specialists, agronomists, soil scientists and WCC's project officers in the study area.

Form of items

The items selected for the construction of knowledge test on NRM practices were framed in the objective form viz., multiple choice, fill in the blanks and Yes or No. The particulars on the type of questions were furnished in the Table 2. (Dey and Sarkar (2011); Raju (2002); Eswarappa (1991); Iqbal (1991); Jaiswal, Purnadare and Yadappanwar (1982); Kadam, Patli and Haridwar (2001); Khan (1999). Krishnamohan (1992). Krishnamurthy (1993). Prasad (1990).

Pre-testing

The items selected for the knowledge test were pre-tested separately by administering the items to 90 watershed farmers. Care was taken to see that selection of matching sample of 90 watershed farmers from non-sampling area.

Item analysis

Item analysis was carried out by administering the pre-tested items to 30 watershed farmers.

Item analysis was carried out by determining the index of 'Item difficulty' and index of 'Item discrimination'. The 'Item difficulty' indicates the extent to which an item was difficult. The function of the item discrimination index was used to find out whether an item really discriminates a well-informed watershed farmer from poorly informed respondent.

The data thus obtained was subjected for typical item analysis. The 60 test items were administered to each one of the 30 watershed farmers. The scores assigned were 'one' for correct answer and 'zero' for incorrect response. After computing the total scores were obtained for each of the 30 watershed farmers on 60 items. They were rank ordered. Based on which the watershed farmers were then divided into six equal groups. These groups were labeled as G1, G2, G3, G4, G5 and G6 with fifteen watershed farmers in each group. For the purpose of item analysis, middle two groups G3 and G4 were eliminated keeping only four extreme groups with high and low scores.

After getting the four extreme groups for item analysis, the responses for each of the items were subjected to calculate difficulty index, discrimination index and point biserial correlation as given below.

Item difficulty index (P)

The item difficulty index was worked out as the percentage of watershed farmer answering an item correctly. The assumption of the item difficulty index was that, the difficulty is linearly related to the level of watershed farmer's knowledge about NRM practices. The items with 'P' values ranging from 0.20 to 0.80 were considered for the final selection of the knowledge test battery. Difficulty Index was computed by using the following formula and presented in Table 1.

$$\text{Difficulty index} = \frac{\text{No. of respondents answering correctly}}{\text{Total no. of respondents}}$$

Discrimination index (E 1/3)

The second criterion for item selection was the item discrimination index indicated by 'E 1/3' which is calculated by the formula.

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

Where S1, S2, S5 and S6 are the frequencies of correct answers in groups G1, G2, G5 and G6, respectively. N is the total number of watershed farmers of the sample selected for items analysis that is 30. The value of the discrimination index for the knowledge items on NRM practices were presented in Table 1. The items with E 1/3 value ranging from 0.2 to 0.8 were considered for the final selection of knowledge test.

Point biserial correlation (r pbis)

The main aim of calculating Point biserial correlation (rpbis) was to work out the internal consistency of the items i.e., the relationship of the total score to a dichotomized answer to any given item. In a way, the validity power of the item was computed by the correlation of the individual item of preliminary knowledge test calculated by using following formula.

$$r\ pbis = \frac{M_p - M_Q}{S.D.} \times \sqrt{PQ}$$

Where,

r pbis = point biserial correlation coefficient

MP = Mean of the total scores of the respondents who answered the item correctly or

$$MP = \frac{\text{Sum of total of XY}}{\text{Total number of correct answers}}$$

MQ = Mean of the total scores of the respondents who answered the item incorrectly or

$$MQ = \frac{\text{Sum total of X - Sum total of XY}}{\text{Total number of wrong answers}}$$

S.D = Standard deviation of entire sample

Table.1 Respondent in four extreme groups

S.No.	Frequencies of correct answer of respondents in four extreme groups				Difficulty index	Discrimination power	Rpbis
	G-1	G-2	G-5	G-6			
1.	10	10	2	0	0.55	0.9	1.11*
2.	10	10	4	1	0.63	0.75	0.93*
3.	10	10	4	1	0.63	0.75	1.14*
4.	10	10	10	6	0.90	0.2	0.60*
5.	10	10	0	0	0.50	1	2.57*
6.	10	10	3	0	0.58	0.85	1.31*
7.	10	10	5	0	0.63	0.75	0.93*
8.	10	10	5	0	0.63	0.75	0.93*
9.	10	9	0	0	0.48	0.95	NS
10.	10	10	9	1	0.75	0.5	0.76*
11.	10	3	0	0	0.33	0.65	NS
12.	10	8	10	9	0.93	-0.05	0.35**
13.	10	9	3	0	0.55	0.8	NS
14.	10	10	0	0	0.50	1	NS
15.	0	5	8	10	0.58	-0.65	NS
16.	10	10	8	2	0.75	0.5	0.76*
17.	10	10	6	2	0.70	0.6	0.80*
18.	10	10	7	5	0.80	0.4	0.61*
19.	10	10	9	7	0.90	0.2	0.56*
20.	8	7	3	1	0.48	0.55	NS
21.	10	10	7	2	0.73	0.55	0.79*
22.	10	10	5	3	0.70	0.6	0.85*
23.	10	10	7	8	0.88	0.25	0.58*
24.	10	10	0	0	0.50	1	NS
25.	8	3	4	2	0.43	0.25	NS
26.	10	9	2	0	0.53	0.85	2.82*
27.	9	3	0	0	0.30	0.6	NS
28.	10	5	2	0	0.43	0.65	NS
29.	5	9	10	10	0.85	-0.3	NS

S.No.	Frequencies of correct answer of respondents in four extreme groups				Difficulty index	Discrimination power	Rpbis
	G-1	G-2	G-5	G-6			
30.	9	9	10	8	0.90	0	0.40*
31.	10	3	0	0	0.33	0.65	NS
32.	10	3	0	0	0.33	0.65	NS
33.	8	6	0	0	0.35	0.7	NS
34.	6	6	0	0	0.30	0.6	NS
35.	10	10	8	0	0.70	0.6	0.82*
36.	8	7	4	5	0.60	0.3	NS
37.	6	2	0	0	0.20	0.4	NS
38.	6	2	0	0	0.20	0.4	NS
39.	5	1	0	0	0.15	0.3	NS
40.	1	1	0	0	0.05	0.1	NS
41.	2	2	0	0	0.10	0.2	NS
42.	1	1	0	0	0.05	0.1	NS
43.	10	10	0	0	0.50	1	2.57*
44.	2	0	0	2	0.10	0	NS
45.	3	0	2	1	0.15	0	NS
46.	1	1	0	0	0.05	0.1	NS
47.	9	4	0	3	0.40	0.5	NS
48.	10	10	4	1	0.63	0.75	1.02*
49.	10	10	3	0	0.58	0.85	1.67*
50.	10	8	9	4	0.78	0.25	0.76*
51.	9	10	9	7	0.88	0.15	0.58*
52.	10	3	0	0	0.33	0.65	NS
53.	10	10	9	5	0.85	0.3	0.65*
54.	10	10	0	0	0.50	1	2.57*
55.	10	10	7	7	0.85	0.3	0.62*
56.	10	8	0	0	0.45	0.9	NS
57.	10	10	4	1	0.63	0.75	1.02*
58.	10	6	0	0	0.40	0.8	NS
59.	9	2	0	0	0.28	0.55	NS
60.	10	10	7	7	0.85	0.3	0.62*

Table.2 Level of knowledge of watershed farmers towards nrm practices

S.NO	Practice /technology used for Natural Resource Management	YES	NO
1	The important natural resource is: A. soil B. water C. vegetation D. all		
2	Watershed is: A. small Area B. specific area with common drainage point C. area with nala D. no idea		
3	Integrated farming is beneficial for: A. higher benefits B. sustaining the production C. efficient utilization of resources D. all		
4	Natural resource management is possible only by the community participation Yes/No		
5	Natural resource management is possible only by public budget Yes/No		
6	The excessive use of the natural resources is harmful. Yes/no		
7	Soil is being eroded due to A. rain water and wind B. excessive/improper land leveling C. A&B D. no idea		
8	Bunds can be strengthened by: A. planting grasses on it B. compacting the bund C. no idea D. A&B		
9	Vegetation helps in conservation of soil by: A. checking the erosion B. addition of litter material C. checking the speed of runoff D. all		
10	Live fencing in the field can be used for A. to reduce soil erosion B. to reduce water loss C. A& D D. protect the crops from animals		
11	Loose boulder structure and can be used for............ A. to reduce soil erosion B. to reduce water velocity C. to increase moisture in the soil D. all the above		
12	Soil conservation means A. Using and managing land based on its capability B. Application of practices that do not damage the soil C. A&B D. None		
13	Removing the trees leads to: A. high erosion B. no effect C. reduce fertility		

	D. A&C		
14	Fruit plantation on bunds helps in A. getting additional income B. conserving soil and water C. improving soil fertility D. D. All		
15	The plants which are highly recommended for live fencing……………..		
16	The grass which is highly recommended as vegetative barrier is……….		
17	Avoid repletion of jowar crop in the same filed for controlling of …………		
18	Transformation of soil in uncultivable fields will increase soil fertility Yes/No		
19	Construction of 'Sappillu' can arrest soil erosion Yes/No		
20	Water harvesting structure in the field is: A. farm pond B. check dams B. C. dug out pond D. All		
21	Sunken pits can be used for A. to conserve excess runoff water B. to protect the soil in water C. to store the water in the soil D. all of the above		
22	Gully formation can be checked by: A. building by check dams B. increasing the width of the gully C. Leaving it as it is. D. D. no idea		
23	Dug out pond can be used for A. to store the waste water B. to increase ground water recharge in nearest wells and bores C. A & B D. no idea		
24	Check dams can be used for soil and water conservation Yes/No		
25	Stabilization of gullies and construction of check dams can be used for increasing ground water recharge Yes/No		
26	Small percolation tanks and mini percolation tanks can be used for increasing ground water recharge. Yes/No		
27	Staggered trenches on slopes can be used for…………………		
28	Water Absorption Trench at the foot of hills can be used for conserving water		
29	Water harvesting and recycling structure useful for irrigation Yes/no		
30	Check walls can be used for…………………………		

P = Proportion of respondents giving correct answer to the item

$$P = \frac{\text{Total number of correct answers}}{\text{Total number of respondents}}$$

Q = Proportion of respondents giving incorrect answer to the item

Q = 1 – P

X = Total score of the respondent for all items

Y = Response of the individual for the items

XY = Total score of the respondent multiplied by the response of the individual to the item

Items having significant point bi serial correlation at 1% and 5% level were selected for final knowledge test and are presented in Table 1.

Representativeness of the test

Care was taken to see that the test items selected finally covered the entire universe of the relevant behavioural aspects of watershed farmer's knowledge about NRM practices..

Selection of the items

Out of 60 items, 30 items were finally selected based on;

Items with difficulty level indices ranging from 0.20 to 0.80.

Items with discrimination indices ranging from 0.20 to 0.80.

Items having significant point biserial correlation either at 1 percent or 5 percent level.

Thus, the finally selected knowledge items comprising 3 types of questions i.e. multiple choice, fill in the blanks and Yes or No, totaling to 30 items of test battery on knowledge of NRM Practices.

The final knowledge test items selected for the test are given in the interview schedule furnished in Table 2.

Reliability of the test

The test was administered to 30 watershed farmers separately with an interval of 15 days. The two sets knowledge scores obtained by the watershed farmers were correlated. The correlation co-efficient (r=0.82) was highly significant indicating a high degree of dependability of the instrument for measuring knowledge of watershed farmers

Validity of the test

Knowledge test developed on NRM practices was subjected to content and construct validity. The construct validity of the test items was tested by the method of point biserial correlation (rpbis). The items have significant values at 1% and 5% level indicated the construct validity of the test.

The content validity of knowledge test was derived a long list of test items representing the whole universe of NRM practices collected from various sources as discussed earlier. It was assumed that the score obtained by administering the knowledge test of this study measures level of knowledge of watershed farmers towards NRM practices.

Thus the knowledge test developed in the present study can measure the knowledge of watershed farmers towards NRM practices as it showed the greater degree of reliability and validity.

Administration of the test

All the 30 items in the knowledge test read out to the respondents after establishing rapport with them. The respondents were asked to answer the items by themselves.

Following are the statements on level of knowledge of watershed farmers towards NRM. Please give your response to these statements on two point continuum. i.e. Yes and No with a tick (√) mark

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