

Case Study

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Construction of Knowledge Test to Measure the Level of Knowledge of Farmers on Climate Resilient Technologies

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ABSTRACT

Climate change impacts on agriculture are being witnessed all over the world, but countries like India are more vulnerable in view of the huge population dependent on agriculture, excessive pressure on natural resources and poor coping mechanisms. NICRA is an ICAR initiative launched to focus on educating and demonstrating the climate resilient agriculture technologies to the farmers. The study was conducted in Ananthapuram district of Andhra Pradesh to find out the knowledge of farmers towards climate resilient technologies. Pertinent items were collected covering all aspects of climate resilient technologies. 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. Out of 60 items, 39 were finally selected. The calculated value of reliability Co-efficient (0.78) for whole test found to be highly significant indicating that the test was highly stable and reliable. The social science researchers can make use of this to test the knowledge level of farmers on climate resilient technologies and thereby the extension personnel can intervene in the areas where the farmers lack the knowledge and see that the farmers adopt these technologies.

Keywords

Climate resilient technologies,
Knowledge level,
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Introduction

Agricultural productivity in rainfed areas continues to remain low and unstable due to weather aberrations, nutrient disorder and poor socio-economic status of farmers. Recurrent droughts undermine the food, fodder and livelihood security of the rural mass and force them to migrate in search of

work. Rainfall is the key variable influencing crop productivity in rainfed farming. Intermittent and prolonged droughts are a major cause of yield reduction in most crops.

Climate resilience is the ability of a system to absorb shocks and recover as quickly as possible to normal conditions when external environment improves.

NICRA is an ICAR initiative, launched to focus on process of developing contingency plans for all the rural districts of the country and it is being implemented at 121 districts of the country in collaboration with ICAR research institutes, SAUs and KVKs. The focus of the programme is not only to demonstrate the climate resilient agriculture technologies but also to institutionalize mechanisms at the village level for continued adoption of such practice in sustainable manner. In Andhra Pradesh five KVKs at Ananthapuram, Kurnool, Chittoor, Srikakulam and West Godavari districts are implementing the NICRA project. Ananthapuram district was selected for the present study. Ananthapuram is the second most drought-affected district of India. Over the years, the process of desertification has been taking place in large tracts of the district because of soil erosion and sand casting on one hand, mono-cropping, and inadequate water resources due to depleted water table on the other. The average rainfall is around 552 mm per year, some parts of the district have recorded as low as 200 mm in bad years. The KVK at Reddipalli located in Ananthapuram district is implementing the NICRA project since 2011 and has been demonstrating climate resilient technologies in the selected villages. In order to study the awareness of the farmers towards these technologies, a knowledge test was developed to study the level of knowledge possessed by the farmers on climate resilient technologies in the selected villages.

Construction and standardization of knowledge test

Collection of items

The content of the test composed of questions called items. A comprehensive list (60) of knowledge questions on climate resilient technologies was prepared on the basis of

extensive review of literature, consultation with scientists of ANGRAU, KVK Ananthapuram and Extension officers of State Department of Agriculture of Andhra Pradesh.

Form of questions

Objective form of questions were framed for testing the knowledge of the respondents on climate resilient technologies so that the respondents elucidated their response by filling the blanks, choosing correct answers, answering yes or no and true or false. The particulars on the type of questions were furnished in the Table 2 (Ghintala and Singh, 2013; Manoj *et al.*, 2013; Randhir *et al.*, 2014; Surat Singh and Sarju, 2014).

Pre-testing

The items selected for the knowledge test were pre-tested separately by administering the items to 60 respondents. Care was taken to see that 60 respondents selected for this purpose were outside the main sample of this study.

Item analysis

The Item analysis was carried out to yield two kinds of information *viz.*, indices of 'Item difficulty' and 'Item discrimination'. The index of item difficulty indicates the extent to which an item was difficult. The later provides information on how well an item measures or discriminates a well informed respondent from poorly informed respondent.

To analyse the items undertaken for item analysis, each response for multiple choice, fill in the blanks, true or false and yes or no questions were given a score of one and zero for correct and incorrect responses respectively. After computing the individual total score for the 60 respondents, the

respondents were arranged in descending order based on total score. These 60 respondents were then divided into 6 equal groups named as G1, G2, G3, G4, G5, and G6 with 10 respondents in each group. For item analysis, the middle two groups G3 and G4 were eliminated keeping only 4 extreme groups, with high scores namely, G1 and G2 and low scores namely, G5 and G6. After getting the four extreme groups for item analysis, the responses for each of the items were subjected to calculation of difficulty index, discrimination index and point biserial correlation

Item difficulty index

The item difficulty index of each of the items, that is, the percentage of respondents answering an item correctly was computed by using the following formula.

$$\text{Item difficulty index (P)} = \frac{\text{No. of respondents answered correctly}}{\text{Total no. of respondents}} \times 100$$

The items with difficulty index ranging from 20 to 80 were considered for final selection for the knowledge test to avoid extremely simple and difficult items.

Discrimination index

Discrimination index of each of the items were computed by using the following formula.

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

where, S1, S2, S5 and S6 are the frequencies of correct answers in groups G1, G2, G5 and G6, respectively and N=Total number of respondents in the sample selected for items analysis (60).

The items with $E^{1/3}$ value ranging from 0.2 to 0.8 were considering for the final selection of knowledge test.

Point biserial correlation

Point biserial correlation (r pbis) is the test validation in which the criterion of validity is considered to be internally consistent i.e, the relationship of the total score to a dichotomized response to any given item. An item by item computation of point biserial correlation was calculated by using the formula.

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

where,

rpbis = Point biserial correlation

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

(or)

$$M_p = \frac{\text{Sum of } XY}{\text{Total No. of Corrected Answers}}$$

Mq = Mean of the total scores of the respondents who answered the item incorrectly (or)

$$M_q = \frac{\text{Sum of } X - \text{Sum of } XY}{\text{Total No. of wrong items}}$$

SD = Standard deviation of the entire sample

p = Proportion of the respondents giving correct answer to the item

q = Proportion of the respondents giving incorrect answer to the item

(or)

q = 1- p

X = Total score of the respondent for all the items

Y = Response of the individual for

the items (Correct =1; Incorrect =0)
 $XY = \text{Total score of the respondent multiplied by the response of the individual to the item.}$

Items having significant point biserial correlation, either at 1 per cent or 5 per cent level were selected for the final test of the knowledge (Table 1).

Selection of the items

Out of 60 items, 39 items were finally selected based on the following criteria.

Items with difficulty level indices ranging from 20 to 80.

Items with discrimination indices ranging from 0.20 to 0.80.

Items having point biserial correlation either at 1 per cent or 5 per cent level

All important components of the recommendations have been covered. The questions were prepared in such a way that no important component has been left out.

The finally selected 39 knowledge test items comprised of four types of questions viz., multiple choice (10 Nos.), fill in the blanks (12 Nos.), yes or no and true or false (17 Nos.).

Reliability of the test

Split half method was used to compute the reliability of the test. The test administered to 60 respondents was divided into two halves based on odd and even numbered statements. Two sets of scores were derived on half forms of the test and the scores were correlated for the reliability of the half test.

The self-correlation of the whole test was then estimated by the Spearman Brown prophecy formula. The calculated value of reliability Co-efficient (0.78) for whole test found to be highly significant, hence it was concluded that test was reliable.

Validity of the test

Knowledge test developed on climate resilient technologies was subjected to content and construct validity. The construct validity of the test items was tested by the method of point biserial correlation (r_{pbis}). The items which have significant values at 1% and 5% level indicated the validity of the test.

The content validity of knowledge test was derived from a large pool of test items separately. The test items represented the whole universe of climate resilient technologies. It was thus assumed that the scores obtained by administering the knowledge test of this study measures what intended to measure.

Thus the knowledge test developed in the present study can measure the knowledge of the beneficiary and non-beneficiary farmers on climate resilient technologies and showed a greater degree of reliability and validity indicating that the test items were valid.

Administration of the test

Each item was read out to the respondents by the investigator and response was recorded with a score of one for correct answer and zero for wrong answer. The possible maximum and minimum possible score that an individual respondent would get were 39 and 0 respectively.

Table.1 Difficulty index, discrimination index, point biserial correlation for knowledge test items

S. No.	Frequencies of correct answers in four extreme groups				Difficulty Index	Discrimination Index ($E^{1/3}$)	Point biserial correlation (rpbis)
1.	8	7	9	9	88.3	0.15	0.125
*2.	9	6	1	2	38.3	0.60	0.166
3.	8	10	10	9	93.3	0.05	0.074
4.	10	9	9	9	91.7	0.05	0.050
5.	10	8	9	9	88.3	0.00	0.017
*6.	7	2	2	0	30.0	0.35	0.110
*7.	8	6	3	2	51.7	0.45	0.164
8.	7	4	7	3	51.7	0.05	0.047
*9.	7	6	2	1	43.3	0.50	0.155
*10.	6	7	3	1	38.3	0.45	0.122
11.	10	10	9	9	91.7	0.10	0.274
*12.	6	3	3	1	36.7	0.25	0.089
*13.	7	5	1	0	36.7	0.55	0.156
*14.	4	5	3	2	36.7	0.20	0.056
*15.	9	5	6	2	50.0	0.30	0.131
*16.	7	6	0	0	33.3	0.65	0.174
17.	9	10	9	8	90.0	0.10	0.194
18.	10	9	10	10	98.3	0.05	0.205
*19.	5	5	1	2	31.7	0.35	0.093
*20.	6	5	1	0	28.3	0.50	0.125
21.	10	10	9	6	90.0	0.25	2.374
*22.	7	5	1	4	36.7	0.35	0.087
23.	9	9	8	10	93.3	0.00	0.063
24.	10	10	8	10	96.7	0.10	0.195
*25.	7	3	3	0	31.7	0.35	0.117
*26.	7	7	7	2	53.3	0.25	0.097
*27.	7	6	0	0	33.3	0.65	0.179
28.	10	10	8	9	90.0	0.15	0.376
*29.	7	6	1	2	40.0	0.50	0.132
*30.	8	5	1	0	38.3	0.60	0.180

31.	9	9	7	9	86.7	0.10	0.096
32.	10	9	9	7	90.0	0.15	0.365
*33.	6	4	4	1	41.7	0.25	0.072
*34.	8	6	5	5	51.7	0.20	0.075
*35.	6	5	4	1	38.3	0.30	0.093
*36.	6	6	2	0	35.0	0.50	0.126
37.	9	8	7	7	75.0	0.15	0.100
*38.	5	7	1	0	31.7	0.55	0.146
*39.	7	6	4	3	48.3	0.30	0.075
40.	10	8	7	8	78.3	0.15	0.083
*41.	7	7	3	2	51.7	0.45	0.153
*42.	6	4	4	2	43.3	0.20	0.063
*43.	4	7	0	1	30.0	0.50	0.130
44.	9	10	7	7	81.7	0.25	0.195
*45.	9	5	2	3	48.3	0.45	0.128
*46.	7	10	5	7	75.0	0.25	0.084
*47.	10	8	5	3	58.3	0.50	0.198
48.	8	9	10	5	80.0	0.10	0.087
*49.	8	7	0	5	46.7	0.50	0.121
*50.	10	9	5	9	80.0	0.25	0.176
*51.	6	6	5	1	46.7	0.30	0.071
52.	9	7	9	8	83.3	0.05	0.049
*53.	6	8	1	2	46.7	0.55	0.167
*54.	7	6	5	2	45.0	0.30	0.105
55.	3	5	4	4	36.7	0.00	0.004
*56.	6	6	1	1	38.3	0.50	0.115
57.	5	4	5	1	35.0	0.15	0.070
*58.	7	7	3	0	41.7	0.55	0.143
*59.	4	2	1	0	20.0	0.25	0.086
*60.	6	6	3	0	38.3	0.45	0.136

* Significant

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ANNEXURE

Table.2 Knowledge level of NICRA and Non NICRA beneficiary farmers on climate resilient technologies

- Select correct answers from the given alternatives**
1. What is climate resilience
 - a. Ability to adopt to variations in climate
 - b. Increase in temperature
 - c. Changes in climate
 - d. None of the above
 2. How can we improve the water retention in the soil
 - a. Mulching
 - b. Ploughing
 - c. Frequent irrigations
 - d. None of the above
 3. How can we reduce soil erosion
 - a. By ploughing along the slope
 - b. By ploughing across the slope
 - c. Deep ploughing
 - d. None of the above
 4. Which of the following are Green manure crops
 - a. Sunhemp
 - b. Daincha
 - c. Pilli pesara
 - d. All
 5. What is Integrated farming system
 - a. Intercropping system
 - b. combining Agriculture with livestock and fishery
 - c. Moisture conservation methods
 - d. None of the above

6. What is the project implemented by central government to popularize climate resilient technologies
 - a. NICRA
 - b. DWACRA
 - c. DRDA
 - d. MGNREGA
7. What is the full form of NICRA
 - a. National initiative on crop resilient agriculture
 - b. National initiative on climate research agriculture
 - c. National institute on climate resilient agriculture
 - d. National initiative on climate resilient agriculture
8. KVK is implementing NICRA project through popularizing
 - a. Crop production techniques to mitigate Drought
 - b. Custom hiring centres
 - c. Capacity building program
 - d. All the above
9. Water is sprinkled in the cattle shed to overcome heat stress through
 - a. Foggers
 - b. Dusters
 - c. Steamers
 - d. Sprayers
10. The Institutional intervention that acts as supporting system for taking up technological interventions at grassroot level
 - a. Custom hiring centres
 - b. Village Climate Risk Management Committee
 - c. Cooperative societies
 - d. Market committees

State True/False and Yes/No From the following statements :

11. Do you know that climate resilient technologies are implemented under NICRA project (Yes/No)
12. Impact of climate change can be overcome through climate resilient technologies (True/False)
13. Conservative furrows do not improve the infiltration capacity of soil (True/False)
14. Crop rotation improves soil structure and fertility from varied root Structures (True/False)
15. Soil testing of the fields must be done every year (True/False)
16. Foliar application of Nutrients at critical crop growth stages is not a drought mitigating technique (True/False)
17. Urea molasses blocks are given to supplement minerals to milch animals under nutrient management (True/False)
18. The optimum plant population to be maintained per square meter in Groundnut is 28 (True/False)
19. Paddy transplantors and rotovators are the only implements given to the farmers on rental basis through Custom Hiring Centres (True/False)
20. Desilting of check dams is helpful for recharge of open wells and Tube wells in the

- vicinity of check dam (True/False)
21. Subsoiler breaks the impermeable soil layer for more percolation of water(True/False)
22. Short duration varieties are not recommended under delayed monsoons(True/False)
23. Farm yard manure supplies only macro nutrients (True/False)
24. Direct Seeded Rice is the method to save water in rice cultivation (True/False)
25. DAP fertilizer contains only phosphorus nutrient (Yes/No)
26. Feed enrichment with mineral salt sticks is given to sheep lambs to avoid indigestion (True/False)
27. Contour bunding reduces soil erosion and conserves soil (True/False)

Fill in the Blanks :

28. Seed treatment in paddy is done with _____
29. Rainwater is harvested by excavating _____ in farmers fields
30. _____ are dug surrounding the field to conserve excess soil moisture
31. Drought tolerant groundnut variety cultivated in Ananthapuram is _____
32. To improve soil fertility _____ crops are grown preceding paddy
33. The process of cutting and storing the fodder for later usage is _____
34. _____ are established to provide quality seed of climatically resilient varieties to farmers
35. _____ is done to overcome competition in plant population during moisture stress
36. _____are maintained to facilitate year round availability of fodder.
37. LRG-41 is tolerant to _____ pest
38. Pre emergence herbicide used in direct sown paddy is _____
39. Common disease in sheep is _____