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A Scale to Measure Knowledge Level of Dairy Farmers Affected by Kerala Flood 2018 On Disaster Preparation

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ABSTRACT

Kerala is worst affected by flood disaster in August 2018. Dairy sector was one of the worst affected with loss of dairy animals and milk production. In this context, it is imperative that the dairy farmers are sensitised and trained to face future disasters confidently. With this background the present study was contemplated to develop and standardise a scale for measuring dairy farmers' knowledge on disaster preparation. A total of 52 statements were collected after referring literature and discussion with experts. The prepared 52 items were sent for judge's relevancy rating. After relevancy test 17 items were selected and was subjected to sixty respondents who are flood affected dairy farmers. The respondents' total knowledge score was calculated. Using the scores Difficulty Index, Discrimination Index and Point Bi serial Correlation were calculated. A total of 10 items which fulfilled all the requisite criteria were selected for final Knowledge scale. The validity of the knowledge test was established through content validity. The reliability of the test was determined by the Cronbach alpha coefficient of reliability test after administering the test to 40 flood affected dairy farmers. The present developed scale shows better reliability and has strong and positive correlation between all the items. The test so developed could be used for assessing the knowledge level of dairy farmers on disaster preparation.

***Key words:** Dairy farmers; Difficulty index; Discrimination index; Point bi serial Correlation; Cronbach alpha.*

Knowledge may be defined as those behaviour and test situations, which emphasize upon memorization the remembering, either by recognition or recall of ideas *(Dubey et. al.2016)*. Knowledge has the capacity to make a person enabled to make progress in occupational life using science and technology. It makes human involved in any occupation far more competent, advanced and sophisticated being to handle business *(Shafi and Chauhan, 2021).* Livestock farming plays a significant role in supplementing family income and generating gainful employment in rural farming sector in India. So, improving productivity and profitability of these need based entrepreneurial sectors necessities scientific knowledge-based communication and adoption practices for better livelihood generation of the rural stakeholders *(Goswami and Biswas. 2021).*

Kerala ranked first in overall dairy production system index owing to its highest literacy rate in India, prompting the farmers to acquire more knowledge and awareness about the scientific dairy farming practices and further likely to adopt new technology. The government policies are quite favourable to dairy development. The state has highest crossbred to indigenous cattle ratio and highest AI performed per 1000 breedable population *(Patel et. al. 2019)*

Kerala experienced an abnormally high rainfall from 1 June 2018 to 19 August 2018. As per IMD data, Kerala received 2346.6 mm of rainfall in this period in contrast to an expected 1649.5 mm of rainfall which was about 42 per cent above the normal. *(CWC, 2018).*The devastating flood and associated landslides affected 5.4 million people and claimed over 400 lives. The post-disaster need assessment committee commissioned by the Government of Kerala estimated the economic loss to be more than $3.8 million. *(Hunt and Menon, 2020).* One of the key gaps as observed in Kerala post disaster needs assessment (PDNA) Floods and landslides – August 2018 by United Nations was that the flood warning is understood by people but was ignored. Although the flood warnings were provided to the community, there was reluctance to respond to warnings due to lack of knowledge about the impact of the flood *(Report, 2018).*

Disaster preparedness refers to the measures taken to prepare for and reduce the effects of disasters. Disaster preparedness is a continuous and integrated process resulting from a wide range of risk reduction activities and resources *(IFRC, 2000)*. According to *(Islam et. al. 2018)* in present scenario, disaster preparation is lacking among the population, who are stunned by catastrophe after catastrophe. In the absence of adequate aid, the impacted people are left to essentially fend for themselves utilising a knowledge built up by the local community over decades of struggle.

There is no proper scale available to measure dairy farmers' knowledge on disaster preparation. An appropriate knowledge test helps us to know the level of relevant knowledge of the dairy farmers from time to time. Knowledge test score can also be used as a variable to test its relationship with other variables. The flood and other disasters are more likely to affect humans in coming years. The agriculture and animal husbandry sector are most vulnerable to the disaster fury. In this context it is prudent that the farmers are made knowledgeable about the methods to overcome flood and other disasters successfully. Accordingly, a knowledge test was developed to assess dairy farmer's knowledge on disaster preparation

METHODOLOGY

The present investigation was conducted in two panchayats *viz.,* Kozhinjampara and Perumatty gram panchayats in Palakad district, Kerala during December 2020. For conducting item analysis of knowledge statements, they were subjected to 60 respondents who were selected randomly from afore mentioned panchayats i.e, 30 from each panchayat. Further, for conducting Cronbach alpha reliability test another 40 dairy farmers were selected randomly independent of above sample from two panchayats afore mentioned. The knowledge test was developed by *Lindquist (1951)* and the standardisation of the test items were presented as follow. The content of knowledge test was composed of questions (items). A pool of questions was prepared by referring textbooks, reviewing literature, and conducting discussions with field extension personnel. Finally, a through scrutiny of the item pool was done with the assistance of subject matter specialists. The questions were designed to test the knowledge level of flood affected dairy farmers about disaster preparation. A total of 52 knowledge items were initially constructed for relevancy test.

All the statements collected may or may not be relevant equally in measuring the knowledge level of dairy farmers about disaster preparation. Hence, these statements were subjected to scrutiny by panel of judges who are extension personnel from various institutions across India to determine the relevancy and screening for inclusion in the final scale. For this, the entire item pool was sent to panel of judges who are experts in the field of extension education. The statements were sent to 120 Judges with request to critically evaluate each statement for its relevancy to measure knowledge level of flood affected dairy farmers on disaster preparation. A total of 45 judges responded within stipulated time of 30 days. The judges were requested to give their response on a four-point continuum viz., most relevant, relevant, somewhat relevant and with scores 4, 3, 2 and 1 respectively.

The relevancy score of each item was established by adding the scores on the rating scale for all the judges' responses. From the data three types of tests where relevancy percentage, relevancy weightage and mean relevancy scores was worked out for all the statements. The statements satisfying the following criteria were selected as follows :

Relevancy percentage (%) >70,

Relevancy weightage >0.70

Mean relevancy score > 2.8

A total of 17 items were selected (Table 1).

Item analysis is a process which examines respondent's responses to individual test items (questions) in order to assess the quality of those items and of the test as a whole. Item analysis is especially valuable in improving items which will be used again in later tests, but it can also be used to eliminate ambiguous or misleading items in a single test administration. The procedure for item analysis is based on a very simple method for what happens when any person encounters any item. The method says that outcome of such encounter is governed by the product of the ability of the person and easiness of the item. The more able the person, the better his chances for success with any item. The easier the item, the more likely that any person to solve it *(Wright and Panchapakesan, 1969).*

All the items collected for the construction of the knowledge test were in the objective form. The questions were yes or no items involving impersonal and objective assessment. The 17 questions selected were subjected to sixty respondents who were flood affected dairy farmers. The responses were scored. For each correct answer, one mark was assigned. For each wrong answer as well as those which the respondents don't know are scored as zero. The respondents' total knowledge score was calculated by summating the scores of all the questions. The calculated knowledge scores were used to calculate Difficulty index, Discrimination index and Point bi-serial correlation.

Difficulty index (p-value), also called ease index, describes the percentage of respondents who correctly answered the item. It ranges from 0 - 100%. The higher the percentage, the easier the item. The recommended range of difficulty is from 25 – 75 per cent. Items having p-values below 25 per cent and above 75 per cent are considered difficult and easy items respectively. *(Hingorjo and Jaleel, 2012).* The difficulty index of each of the 17 items were calculated dividing the total correct responses for a particular item by total number of respondents as under :

$$Pi = \frac{ni}{Ni} \times 100$$

Where,

Pi = difficulty index in percentage of the i^th^ item

ni = number of respondents giving correct answer to i^th^ item

Ni = total number of respondents to whom the items were administered i.e. 60

Discrimination index is a measure, of how the 'good' respondents are doing versus the 'poor' respondents on a particular question. *(Taib and Yusoff, 2014).* The statement which is answered correctly by everyone or the one which is not answered by anyone in the sample had no discrimination value. Therefore, only those statements with high power to discriminate the respondents who varied in the level of knowledge were included in the final list. The discrimination power of all the seventeen items were worked out using E1/3 method to find out the item discrimination, as given below. In this method, those 60 respondents were divided into six equal groups, each having ten respondents and they were arranged in descending order of their magnitude of their knowledge scores as obtained from them. The middle two groups were eliminated. Only four extremes groups i.e. the groups with highest and lowest scores were considered in order to calculate the 'Discrimination Index' by the following formula:

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

Where,

N is Total number of respondents to whom the items were administered.

S1 & S2 are the frequencies of correct answers of highest and higher scores, respectively

S5 & S6 are the frequencies of correct answers of lower and lowest scores, respectively.

Point bi serial correlation (Rpbis) : The point bi serial correlation is the correlation between the right/wrong scores that respondents receive on a given item and the total scores that the respondents receive when summing up their scores across the remaining items. It is special type of correlation between a dichotomous variable and a continuous variable *(Varma, 2006).* To check the internal consistency of an item, its relationship with the total score when it was found to a dichotomised answer to a given item,point bi-serial correlation was computed as

$$Rpbis = \frac{Mp - Mq}{S} \times \sqrt{pq}$$

Where,

Rpbis = point biserial correlation,

Mp = mean of the total score of the respondents who answered an item correctly

Mq = mean of the total score of the respondents who answered an item in correctly, sigma is the standard deviation of the entire sample,

p = proportion of the respondents giving correct answer to an item,

q = proportion of the respondents giving incorrect answer to an item,

S = standard deviation of the total sample on the test.

The calculated point biserial correlation values were statistically tested with n-2 degrees of freedom.

Final selection of the items for the test : All the items which had a difficulty index ranging from 0.25 to 0.75, discrimination index above 0.2 and point biserial correlation value which was significant at 5 per cent level of significance were finally selected for the knowledge test and this comprised of 10 items (Table 1).

The collected data were tabulated and analysed to estimate the alpha value. The alpha was calculated using formula as follows :

$$\alpha = \frac{K}{K-1}\left(\frac{\sum_i^k - 1\,\sigma^{2yi}}{\sigma^2 x}\right)$$

Where,

α = Cronbach's alpha reliability coefficient,

K = Number of items,

$\sigma^2 y_i$ = the variance of item i for the current sample of persons,

$\sigma^2 x$ = the variance of the observed total test scores.

RESULTS AND DISCUSSION

The items were collected from different sources and were administered to 60 respondents. Scores were given as 1 against a correct response and 0 for an incorrect one. After getting response of all the 17 items, the difficulty index, discrimination index and point bi serial correlation were calculated using the formula discussed in the methodology section (Table 1). The items, having difficulty index value within 25 to 75 and discrimination index value above 0.2 and point bi serial correlation value which was significant at 5 per cent level of significance were selected as final items of the knowledge test. Thus, finally 10 items (Table 1) were selected for the knowledge test which were considered as neither too difficult nor too easy to reply and could discriminate the well-informed individuals from the less-informed ones.

Validity of the knowledge test : Validity refers to the degree to which evidence and theory support the interpretations of test scores for proposed uses of tests *(Kane, 2016)*.

The validity of the knowledge test was established through content validity. The content validity of the knowledge test was ensured by choosing items in consultation with various subject matter specialists. All possible care was taken while selecting the items and the same were subjected to difficulty and discrimination index and point bi serial correlation, to select the final

Table 1. Item analysis

Knowledge items	DI	DcI	Rpbis value
Rain fall above 20 cm in 24 hour is denoted by red alert*	63.33	0.65	0.548
Intense rainfall of 6-20 cm in 24 hour is denoted by orange alert*	58.33	0.7	0.581
Rainfall of 6-11 cm in 24 hours is denoted by yellow alert*	76.67	0.55	0.521
The agency responsible for weather forecast is Indian Meteorological department	13.33	-0.1	-0.113
What are the sources of accurate weather forecast? (Name any one)*	40.00	0.35	0.277
What time of the year flood disaster is expected? (Name of the Month / Season)*	48.33	0.45	0.33
Which monsoon brings copious rainfall to Kerala? (Name / Season)*	45.00	0.5	0.379
North east monsoon brings rainfall during October to December *	71.67	0.45	0.435
The forecast of flood disaster is given before 10 days*	38.33	0.35	0.326
Early warning system gives 48 hours lead before a flood disaster	40.00	0.3	0.231
Central Water commission is responsible for forecasting flood	25.00	0.45	0.434
The total number of dams opened during Kerala floods 2018 are 34*	73.33	0.45	0.434
Houses constructed against the vertical side of mountains are vulnerable to earth quake	65.00	-0.05	0.027
The wind speed in ordinary cyclone is 32-88 km/h	25.00	0.35	0.378
The wind speed in severe cyclone is 89- 117 km/h	21.67	0.3	0.393
The wind speed in very severe cyclone is 118-220 km/h	23.33	0.4	0.451
The wind speed in super cyclone is < 221 km/h*	36.67	0.4	0.383

*Statements selected for knowledge test

statements. Hence, it was logical to assume that the test satisfied representative as well as sensible approach of test construction, the criteria for content validity.

Reliability of the knowledge test : Reliability concerns the extent to which a measurement of a phenomenon provides stable and consist result. Reliability is also concerned with repeatability *(Taherdoost, 2016).* A measure should produce similar or the same results consistently if it measures the same 'thing' again and again. It is determined by the consistency with which it measures that which it does measure (*Sarmah and Hazarika, 2012)*

The reliability of the test was determined by the Cronbach alpha coefficient of reliability test. Alpha was first employed in 1951 by *Cronbach (1951)* who presented a measure of the internal consistency of a test or scale and numerically treated between 0 and 1. An attempt was made to study and evaluate the reliability of developed knowledge scale through Cronbach's alpha by using Statistical Package for Social Sciences (SPSS). The test was administered to 40 flood affected dairy farmers who were selected randomly from two panchayats viz., Kozhinjampara and Permatty in Palakad district, Kerala during December 2020.

Cronbach's alpha was found to be excellent .829, which is very high and indicates strong internal consistency among the 10 items. Essentially, this means that respondents who tended to select high scores for one item also tended to select high scores for the others; similarly, respondents who selected a low score for one item tended to select low scores for the other knowledge statements. Thus, knowing the score for one knowledge statement would enable one to predict with some accuracy the possible scores for the other knowledge statements.

Table 2. Item total Statistics

Item	SM	SV	CI	CA
Item 1	1.99	7.299	0.470	0.818
Item 2	1.97	7.394	0.406	0.825
Item 3	1.98	7.848	0.232	0.841
Item 4	2.03	7.448	0.462	0.819
Item 5	1.95	6.619	0.706	0.793
Item 6	1.98	7.440	0.397	0.825
Item 7	1.99	6.999	0.604	0.805
Item 8	1.95	6.310	0.843	0.777
Item 9	1.99	7.049	0.581	0.807
Item 10	1.97	7.190	0.481	0.817

SM= Scale mean if item deleted; SV= Scale Variance if item deleted; CI= Corrected item - total correlation;
CA= Cronbach's Alpha if item deleted.

Table 2 highlights the column containing the 'Corrected Item-Total Correlation' for each of the items. It indicates the correlation between a given knowledge item and the sum score of the remaining items. Table 2 also highlights the Cronbach's alpha that would result if a given item was deleted. It shows that, the alpha value if the given item were not included among a set of items. For example, for Item1, if it was deleted the Cronbach's alpha would drop from the overall total of .829 to .818. It explains that the alpha would drop with the removal of first knowledge statement (Item1), which appears to be useful and contribute to the overall reliability of the knowledge scale.

George and Mallery (2003) provided the following rules of thumb: as the value of Cronbach's alpha >.9 – excellent, >.8 – good, >.7 – acceptable, >.6 – questionable, >.5 – poor and <.5 – unacceptable. While increasing the value of alpha is partially dependent upon the number of items in the scale, it should be noted that this has diminishing returns. In present developed knowledge scale, the alpha value was found to be excellent, which indicates the strong internal consistency among the set of items. Thus, Cronbach's alpha found that items used in scale for data collection were appropriate and reliable.

CONCLUSION

The reliability and validity of the scale indicated the precision and consistency of the results. The present developed scale shows better reliability and has strong and positive correlation between all the items, so there is no need to re-examine and modify the individual items for further investigation. With administering the test, a respondent were given one mark for each correct answer and zero mark for each wrong or don't know answer.

The total score of the respondents on all items of the test were considered as the knowledge score of the respondents. On the basis of their knowledge score the respondents may be categorised as low, medium and high knowledge respondents. The test so developed could be used for assessing the knowledge level of dairy farmers on disaster preparation. Based on the knowledge levels the strategies could be chalked out for implementing disaster mitigation activities. This scale can be used to measure the farmers' knowledge on disaster preparation beyond the study area with suitable modifications.

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