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Development of a scale to analyze the perception of dairy farmers pertaining to meteorological disaster management

¹L Vijay, ²Asif Mohammad, ³Anupam Chatterjee, ⁴Girish CE and ⁵Rayirala Rakesh

¹M.Sc. Scholar, Dairy Extension Section, ICAR- National Dairy Research Institute, Eastern Regional Station, Kalyani, West Bengal, India

²Senior Scientist, Dairy Extension Section, ICAR- National Dairy Research Institute, Eastern Regional Station, Kalyani, West Bengal, India

³Principal Scientist, Animal Nutrition Section, ICAR- National Dairy Research Institute, Eastern Regional Station, Kalyani, West Bengal, India

⁴Ph.D. Scholar, Dairy Extension Section, ICAR- National Dairy Research Institute, Eastern Regional Station, Kalyani, West Bengal, India

⁵Ph.D. Research Scholar, Department of Agriculture Extension Education, Professor Jayashankar Telangana Agriculture University, Rajendranagar, Hyderabad, Telangana, India

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Corresponding Author: L Vijay

Abstract

The study was conducted to develop a valid and reliable scale, to analyze the perception of dairy farmers pertaining to meteorological disaster management. Thurston's technique of equal appearing interval scale was followed in the construction of this scale. This scale has been standardized and found to be reliable and valid. In order to know the perception of dairy farmers pertaining to meteorological disaster management, a comprehensive list of 35 statements was prepared. Statements were edited as per the 14 criteria enunciated by Edward (1957) and at last, 19 statements were selected as they were found to be non-ambiguous. These components along with the statements were mailed to 120 experts for the judge's opinion with (five-point continuum). Out of the 120 judges, 52 judges were replied in time by sending their judgements. Based on the scale (median) and Q values, 10 statements were finally selected to analyze the perception of dairy farmers pertaining to meteorological disaster management. The Split-half method developed by Brown prophecy was employed to measure the reliability. The reliability co-efficient (0.535) and content validity also worked, indicating higher reliability and validity of the scale. The standardized scale would have practical applicability in knowing the perceptual level and thus it facilitates to take right decisions by policymakers.

Keywords: Perception, scale, dairy farmers, meteorological disasters

Introduction

India is the 14th most vulnerable country in the world owing to its extreme weather-related events (Global Climate Risk Index report, 2019). The country has been susceptible to vagaries like floods, drought, heat waves and tropical cyclones since time immemorial (BMTPC, 1997; High powered committee, 2002) [2, 5]. It is reported that 59 percent of land is susceptible to earthquakes in the country, 12 percent of land is prone to floods that is about 40 million hectares in the country. Total coastal line of country is 7,516km out of that 5,700km (about 8 per cent) are prone to cyclones, 68 percent of arable land in the country are at a risk of drought conditions (Ministry of Home Affairs, Government of India, 2015) [6]. There are a total of 36 states and union territories in India, with 27 of them being disaster-prone. The following regions are prone to natural disasters in the country: The northern part of India is vulnerable to snow storms, the Gangetic plains and Deccan

plateau are prone to floods, the western part experiences minimal rainfall and drought conditions and coastal areas like the Sundarbans are highly vulnerable to storms and cyclones (Unnikrishnan and Malavika, 1998) [8].

Sundarbans is famous biodiversity hotspot and a UNESCO heritage site. Sundarbans region lies near to the Bay of Bengal. The region of Sundarbans is not static due to depression of lands, earthquake, tidal waves and cyclones. The region has now started to witness the climate change. The fluctuation of water levels, temperatures and wind flow are altering the entire topology. The course of rivers, sizes of sand dunes among other things, also changes with it. Forests also suffer in all this and forests are also disappearing due to the calamities. The Sundarbans' history is a record of the region's terrible natural disasters. The life has become miserable in this area due to repeated cyclones, tidal waves, floods, earthquakes, heavy rainfall. These disasters leave a deep impression upon the economy of local

people. As the coastal plain of Bengal is located in the tropical belt, cyclones are more regular in the region. The agriculture and livestock economy of this area were totally destroyed by the calamities. Cyclone destroyed the crops, water supply system and communication. These disasters have negative effect on farmers who depend on dairy farming in the region. The cyclones and the devastation they bring can disturb the production, distribution and consumption processes in dairy farmers. In the recent past unprecedented damage has been unleashed by Amphan cyclone in 2020. It is considered to be the strongest cyclone to hit the region in 50 years.

Therefore, the perception of dairy farmers pertaining to meteorological disaster management was inferred within the contextual framework of the study. In this backdrop, the present research paper focuses on the systematic development of a reliable and valid measurement scale to assess the perception of dairy farmers towards various dimensions of meteorological disaster management. The scale is designed to capture farmers' awareness, preparedness, adaptive capacity, and response mechanisms related to meteorological disasters affecting dairy farming. Such a standardized scale would facilitate objective assessment, enable comparison across different contexts, and support evidence-based policy formulation and extension interventions aimed at strengthening disaster resilience among dairy farmers.

Objective

To analyze the perception and need of dairy farmers pertaining to meteorological disaster management.

Methodology

For the development of the perception scale pertaining to meteorological disaster management, Thurstone's Technique of Equal Appearing Interval Scale (1928)^[7] was employed. An initial pool of statements was generated through literature review, expert consultation, and field interactions with dairy farmers. These statements were evaluated by a panel of judges based on their degree of favorableness, and the final items were selected using median scale values and interquartile ranges. The application of this technique ensured the development of a reliable, valid, and objective scale for measuring the perception of dairy farmers regarding meteorological disaster management.

Results and Discussion

The following procedure was adopted to develop and standardize the scale to measure the perception of dairy farmers pertaining to meteorological disaster management.

1. Collection of Statements

The items making up a scale of perception are known as statements. A statement may be defined as anything that is said about a psychological object. As a first step in developing the scale, a comprehensive list of 35 statements was prepared were collected from the relevant literature and discussion with the experts of animal husbandry & extension personnel. The statements were selected based on the suggested criteria enunciated by Edward (1957)^[4] and at last, 19 statements were selected as they were found to be

non-ambiguous.

2. Screening of Statements

All the selected statements were mailed to 120 judges (animal husbandry experts, extension experts) and who were having experience in that particular topic. Out of these 120 judges, 52 replied. The responses of 52 judges were retained for the final selection of statements for construction of the perception scale. Based on the obtained Q value of each statement final selection of statements was done. Statements with Q value less than 1.5 was selected. In order to judge the degree of 'Unfavorableness' to 'Favorableness' of each statement on a 5-point equal appearing continuum scale i.e., Strongly Agree (SA), Agree (A), Undecided (UD), Disagree (D) and Strongly Disagree (SD) with the scoring pattern of 5,4,3,2,1 was administered to the dairy farmers.

3. Selection of statements

Statements were selected based on the two parameters

- Scale value (modified median)
- Q value = (C₇₅ - C₂₅)

4. Computation of scale value

The scale value for 19 statements that had been judged in equal appearing intervals by 52 judges was obtained by calculating their medians.

The scale value of the statement is computed as the median positions to which is assigned by the group of judges. The scale value of the statement calculated using the below formula given by Edwards (1969)^[4].

$$S = L + \frac{(0.50 - \sum pb)}{pw} \times i$$

Where,

S= Median or scale value of the statement

L= Lower limit of the interval in which the median falls

$\sum pb$ = Sum of the proportions below the interval in which the median falls

Pw = Proportion within the interval in which the median falls

i = the width of the interval and is assumed to be 1.0

Computation of Q values

The Q value of the statement calculated by using the following formula

$$Q = (C_{75} - C_{25})$$

$$C_{75} = L + \frac{(0.75 - \sum pb)}{pw} \times i$$

$$C_{25} = L + \frac{(0.25 - \sum pb)}{pw} \times i$$

Where,

L= the lower limit of the interval in which the 75th centile falls

$\sum pb$ = the sum of the proportions below the interval in which the 75th centile falls

pw = the proportion within the interval in which the 75th centile falls

i= the width of the interval and is assumed to be equal to 1.

Table 1: Final set of statements selected for analysing perception

S. No.	Statements	S value	Q value	Nature of Statement
1.	I feel proper meteorological disaster management can reduce the threat to the livelihood security of dairy farmers	8.14	1.12	Positive
2.	I think suitable health management can reduce the transmission of water-borne and vector-borne communicable diseases of livestock	8.17	1.27	Positive
3.	I feel that inaccurate feeding management will increase the risk of death due to starvation during a meteorological disaster.	8.24	1.33	Positive
4.	I agree that cuts acquired from disaster debris make animals vulnerable to tetanus by not taking proper health management care	7.96	1.22	Positive
5.	I am aware the best way to save the farm animals is to translocate them to cyclone shelters	8.44	1.30	Positive
6.	I don't think health management involving mass vaccination program may not reduce the fear of disease spread in the herd during a disaster	8.54	1.38	Negative
7.	I feel shelter management through fumigation of the shed using local herbs cannot control the fly population after the flood	8.00	1.27	Negative
8.	I think drinking water management with increased salinity during floods is not required for dairy animals	8.22	1.38	Negative
9.	I believe that indigenous breed can survive more efficiently than crossbred animals after a meteorological disaster	8.31	1.43	Positive
10.	I feel that transportation management for selling product may not become a challenging task for marketing	8.43	1.41	Positive

Standardization of the scale

A scale is considered reliable when it yields consistent results upon repeated application to the same sample under similar conditions. Accordingly, the perception scale developed for the present study was pre-tested for reliability using the split-half method. A pilot study was conducted among 50 respondents selected from a non-sample area, ensuring that the respondents did not form part of the final sample. The scale, comprising 10 statements, was administered and the items were divided into two equivalent halves. The correlation between the two halves was computed and adjusted using an appropriate reliability formula to estimate the overall reliability coefficient of the scale. The results indicated satisfactory internal consistency, thereby confirming the reliability of the developed scale.

Reliability of the scale

Reliability refers to the degree of consistency with which a test measures a construct, indicating the extent to which the same individuals obtain similar scores when re-examined under comparable conditions or at different points in time (Anastasi, 1986). In the present study, the reliability of the developed perception scale was assessed using the split-half technique, which is widely employed to determine the internal consistency of measurement instruments. The finalized perception scale, comprising 10 items, was divided into two equivalent halves consisting of odd- and even-numbered items. These two sets were administered to 50 respondents selected from a non-sampling area to avoid bias. The total scores obtained by each respondent for the odd and even item sets were computed separately, and the Pearson's product-moment correlation coefficient was calculated between the two sets of scores. The obtained correlation coefficient ($r = 0.535$) was found to be significant at the 1 per cent level, indicating a high degree of internal consistency. This result confirms that the developed perception scale is sufficiently reliable for measuring the perception of dairy farmers pertaining to meteorological disaster management.

Validity of the test

The content of the perception scale was derived from the

expert opinions and insights of subject matter specialists, particularly extension scientists, who possess substantial experience in the domain of meteorological disaster management and dairy farming. Throughout the process of scale construction, all essential steps and standard procedures of scale development were meticulously followed, including item generation, scrutiny, and refinement to ensure relevance and clarity. Since the statements included in the final scale adequately represented the various dimensions of the construct under study, it can be concluded that the perception scale effectively measured what it was intended to measure, thereby establishing its content validity.

Administering the scale

The final perception scale comprised 10 carefully selected statements designed to measure the perception of dairy farmers pertaining to meteorological disaster management. Responses to each statement were obtained on a five-point continuum, namely *Strongly Agree*, *Agree*, *Undecided*, *Disagree*, and *Strongly Disagree*. These response categories were assigned weighted scores of 5, 4, 3, 2, and 1, respectively, for positively worded statements, while the scoring was reversed for negatively worded statements to maintain uniformity in interpretation.

The scores obtained for all the ten statements were summed to compute the overall perception score of each respondent. Accordingly, the possible perception score ranged from a minimum of 10 to a maximum of 50, with higher scores indicating a more favourable perception towards meteorological disaster management. The scale thus facilitated a systematic and quantitative assessment of respondents' perceptions.

Conclusion

From the various techniques available for constructing a perception scale, Thurstone's Technique of Equal Appearing Interval Scale was employed to measure the perception of dairy farmers pertaining to meteorological disaster management, owing to its scientific rigor and ability to ensure objectivity in attitude measurement. The systematic application of this technique facilitated the

selection of statements with appropriate scale values and discrimination power, thereby enhancing the reliability and validity of the instrument. Based on the cumulative perception scores obtained through the finalized scale, the perceptual level of dairy farmers was categorized into low, medium, and high groups. This categorization enabled a meaningful interpretation of farmers' perceptions and provided a clear basis for identifying perception gaps, thereby offering valuable insights for designing targeted extension strategies, capacity-building programmes, and policy interventions aimed at strengthening meteorological disaster preparedness and management among dairy farmers.

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