International Journal of Environment and Climate Change

Volume 13, Issue 9, Page 65-74, 2023; Article no.IJECC.101421
ISSN: 2581-8627
(Past name: British Journal of Environment & Climate Change, Past ISSN: 2231–4784)

Developing a Scale to Measure the Attitude of the Farmers' towards Natural Disaster Management

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

Article Information

DOI: 10.9734/IJECC/2023/v13i92205

Open Peer Review History:
This journal follows the Advanced Open Peer Review policy. Identity of the Reviewers, Editor(s) and additional Reviewers, peer review comments, different versions of the manuscript, comments of the editors, etc are available here: https://www.sdiarticle5.com/review-history/101421

Original Research Article

Received: 13/04/2023
Accepted: 15/06/2023
Published: 26/06/2023

ABSTRACT

A scale measuring the attitude of farmers towards disaster management is developed using the equal appearing interval scale method, which comprises of 8 statements finally. (four positive and four negative). The scale is administered to the 240 farmers for the purpose of the study. The study was conducted in Krishna and NTR districts of Andhra Pradesh. Forty farmers from each mandal were selected using proportionate random sampling technique with the help of pretested interview

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schedule. The results of the study revealed that 76.67 per cent of the respondents were having medium level attitude towards disaster management followed by high (16.67%) and low (6.67%) respectively. From the above findings it is concluded that disaster management team should take necessary steps to change the rate of attitude of farmers towards disaster management.

Keywords: Attitude; disaster management; equal appearing scale; farmer; proportionate random sampling.

1. INTRODUCTION

Andhra Pradesh has a long history of major natural disasters, mostly due to its geographical location and topographic features. Landslides, earthquakes, cyclones, floods, and droughts are frequent occurrences that have a terrible effect on the environment, the economy, and human life. Agriculture is one of the sectors highly reliant on weather, climate, and water availability, which is also negatively impacted by weather- and climate-related disasters that increase the vulnerability of resource-poor farmers in particular and frequently jeopardise their ability to support themselves. Although the Andhra Pradesh government has acknowledged the coastal region of Andhra Pradesh as one of the most highly productive and fertile riverine coastal zones for agriculture, it frequently has low grain output because of climate vulnerability and natural catastrophes. The number of death and loss of socio-economic condition are also increasing with the increasing number of cyclones, floods and drought in coastal areas of AP.

According to reports, coastal Andhra Pradesh is especially susceptible to damage due to storm surges and associated flooding as well as wind damage [1].

The economy and population of the State have suffered in recent years as a result of cyclone and other natural disasters. The State has been impacted by numerous natural calamities from the year 2010, including the Laila Cyclone (May 2010), Heavy rains (South-West Monsoon 2010), Jal Cyclone (October-November-2010), Depression (December, 2010),Thane Cyclone (December –2011), Drought (Kharif 2011), Nilam Cyclone (Oct-Nov-2012), Drought (Kharif-2012), Unseasonal Heavy Rains (Feb-2013), Phailin Cyclone (October-2013), Heavy Rains / floods (October-2013), Hudhud Cyclone (November-2014), Vardah Cyclone (December-2016), Titli cyclone (2018), Fani cyclone (2019), Cyclone Nivar and Burevi (2020) and Gulab cyclone (2021) affecting the livelihood of many families (NADMP, 2020). These natural disasters have long-lasting effects on the lives and livelihoods of farmers and the surrounding community, in addition to harming agriculture and horticulture crops.

Huge losses were brought on by Cyclone Titli, including the destruction of property, displacement from dwelling, loss of work, and in some cases, the loss of life. Most of the farmers dissatisfied with the services provided by the Governmental [2].

Due to “Nivar” Cyclone, Kharif standing and Rabi cropped area damaged more than 33% under different crops is 4.59 Lakh ha with production loss of 8.57 LMTs worth of 1948.08 Crores monetory loss (Commissionerate of agriculture, AP, Guntur, 2021).

The pre-dominant crop in the state is paddy. The recent cyclone nivar caused significant losses for paddy growers. According to preliminary estimates, paddy crop about 93,872 hectares in Krishna district was damaged [3]. The problem is that most of the farmers could not save the crop from disaster as they did not predict it. Therefore, sustainable and cost-effective disaster management strategies are of timely requirement and local committees should be sensitized for the different adaptation and mitigation options. To raise awareness of these natural disasters, it is necessary to study farmers' attitudes towards disaster management and suggest specialised training programmes. Farmer attitudes toward disaster management must be understood if climatologists, scientists, policymakers, and others are to effectively promote adaptive and mitigated actions in agriculture.

Past studies generally handled the disaster together with the farmer risk attitude. Age, education, location, off-farm income and access to market information were the important and significant factors determining the risk attitude behaviour of farmer [4]. Flooding is the most destructive natural disaster. Farmers were the most affected in terms of damages to crops,

livestock, irrigation systems, water contamination and other agricultural operations. More than half of the farmers had very high risk perception of flood [5]. Similar study conducted by Niranjan and Bose [6] explored that majority of the respondents (63.33%) were having medium favourable attitude towards climate change effects indicating favourable attitude is giving hope for the extension professionals for better implementation of climate change based programmes to the farmers of dryland region.

Bharath et al. [7] developed a scale to measure the attitude of perennial crop farmers towards climate change finally selected ten statements to measure attitude. Study conducted on farmers awareness, perception and attitude towards climate change explored that most of the farmers (73%) reported an increase in temperature over the last 10–15 years. Approximately 8.5% of respondents perceived no change, 15% were receiving a temperature drop and 3.5% did not know if there was a change in temperature over time. It reveal that awareness and attitudes play a mediating role between perception and adaptation behaviour [8]. Farmers perceived that receiving climatic information will lead to more success in agriculture and to better planning for cultivation" which shows positive attitude towards receiving climatic information [9].

While many focus on studying the farmers' attitude towards climate change, relatively little research effort has been focused on studying the farmers' attitude towards disaster management. Extension wing of State Department of Agriculture and State Agricultural University should take up the task of educating the farmers on mitigation mechanisms to be adopted during and after disasters as a continuous process to make the farmers prepared for natural disaster and adopt mitigation mechanism to face disasters. Hence the research paper aims to develop a scale to measure the attitude of farmers' towards disaster management and measuring it.

2. MATERIALS AND METHODS

Based on the discussion with the experts in relevant subject, 60 attitude statements were gathered to develop the scale. The items were screened by following the informal criteria suggested by Edwards [10] for editing the statements to be used in the construction of the attitude scale.

The attitude items to be included in the final attitude scale were selected based on the following criteria.

- The statements selected should represent the universe of content with respect to disaster management
- The scale values of the selected attitude items should have equal appearing interval i.e. distributed uniformly along the psychological continuum.
- Those items with high scale values and smaller Q values should be selected as far as possible.
- There should be more or less equal number of statements with favourable and unfavourable attitudes as far as possible.

The selected statements were sent to judges opinion for item scoring of computation of scale values and Q values. The 60 selected statements were then subjected to judge's opinion on a five-point continuum ranging from most unfavourable to most favourable. The list of statements was subsequently forwarded to 60 judges, who were scientists from the State Agricultural Universitie. Out of 60 judges, 30 judges responded by sending their judgements. The scale values and Q values for 60 statements were calculated using the formula proposed by Thurstone and Chave [11].

$$S = l + \frac{0.5 - \sum pb}{pw} \times i$$

Where,

S – The median or scale value of the statement
l – The lower limit of the interval in which the median falls
Σpb – The sum of the proportions below the interval in which the median falls
pw – The proportion within the interval in which the median falls
i – The width of the interval and is assumed to be equal to 1.0

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

Where,

Q – Interquartile range
C_{75} – the 75th centile, $S = l + \frac{0.75 - \sum pb}{pw} \times i$
C_{25} – the 25th centile, $S = l + \frac{0.25 - \sum pb}{pw} \times i$

After selecting the statement, the reliability and validity of the scale determined. Tthe reliability of

the scale was determined by 'split- half' method. The split-half method is regarded by many as the best of the methods for measuring reliability [12]. The selected eight attitude statements were divided into two halves by odd even method [13]. The two halves were administered separately to 30 disaster affected farmers in a non sample area. The scores were subjected to product moment correlation test in order to find out the reliability of the half-test. The scale was administered to 240 farmers in the study area.

2.1 Selection of the Study Area

From the baseline study it was found that during last 10 years of the present century, coastal areas have faced at least four devastating cyclones of which two hit Krishna district. Every year, 2-3 natural disasters hit this district different time period with different intensities. Among the 26 districts of Andhra Pradesh, Krishna and NTR district were selected as these districts are highly susceptible for the freaky incidence of disasters. So the present research work was conducted in Krishna and NTR districts of Andhra Pradesh. Three mandals from each district were selected based on the severity and intensity of damage due to natural disasters. Totally six mandals were selected for the purpose of study. From the list of mandals, two villages from each Mandal which are regularly affected by disasters were also purposively selected. Thus a total of 12 villages were selected for the purpose of the investigation. Forty farmers from each mandal were selected using proportionate random sampling technique. Thus, totally a 240 respondents selected for the study.

After collection of each day, the data was checked; followed by editing and cleaning to detect errors or omissions and to maintain consistency and validity. Then the tabulation work including editing, coding and tabulation manually and using Excel program. In order to process and analyze the data, simple mathematical tools like average, percentage and tables were used to present the research findings in a meaningful way.

Fig. 1. Description of the study area

3. RESULTS AND DISCUSSION

An objective methodology was devised in order to select the attitude items keeping in mind the above mentioned criteria. In order to calculate the difference between successive scale values and the cumulative total of the computed differences, the scale values were ordered in descending order of magnitude. Eight statements were chosen to make up the attitude scale, taking into account the respondents' time constraints. Since the selected scale values should have equally appearing interval and distributed uniformly along the psychological continuum, it was felt necessary to create eight compartments and to choose one statement from each compartment. Each compartment was created with the idea that they should all be evenly spaced throughout the continuum. The width of the class intervals was determined by dividing the cumulative total by eight, which worked out to 0.403 for this purpose.. Each class interval represented a compartment for the selection of the attitude items.

To select the attitude items from the eight compartments the scale values and the corresponding Q values were considered (Table 1). Items with high scale values and low Q values were chosen from each compartment as one item based on the aforementioned criteria. Care was taken to ensure that the selected items represented the universe of content and covered different aspects of natural disaster management. As a result, eight items were chosen with equal appearing interval and with a uniform distribution along the psychological continuum (Table 3). The attitude scale thus constructed is given.

3.1 Reliability of the Scale

The half-test reliability coefficient (r) was 0.572, which was significant at five per cent level of probability. Furthermore, the Spearman-Brown Prophecy method was used to calculate the reliability coefficient for the whole test. Reliability of the whole test (rtt) was 0.835. According to Singh [13], when the mean scores of the two groups are of narrow range, a reliability coefficient of 0.50 or 0.60 would be sufficient. Hence, the constructed scale is reliable as the reliability rating was greater than 0.60.

3.2 Content Validity of the Test

It referred to the representativeness or sampling adequacy of the content of a measuring instrument [14]. Content validation was carried out by subjecting the selected eight attitude items to judge's opinion. Experts in the selected field of study acted as judges. They were asked to express their judgment regarding the extent to which each attitude item covered the domains of natural disaster management. The responses were obtained on a four-point continuum of 'most adequately covers', 'more adequately covers', 'less adequately covers' and 'least adequately covers'. Scores of 4, 3, 2 and 1 were given for the points on the continuum respectively. Totally 30 judges responded by sending their judgements. The mean score (2.5) was fixed as the basis for deciding the content validity of the scale i.e. if the overall mean score of the attitude items as rated by the judges was above 2.5, the scale will be declared as valid and if not otherwise. In the present case, the overall mean score was worked out as 3.25 (most adequately covers and more adequately covers) therefore, the constructed attitude scale is said to be valid.

It is evident from the Table 5, the statements used for measuring the attitude of farmers towards disaster management and the frequency percentage of responses for the concerned statements. About 87 per cent of the farmers strongly agreed that disaster related problems should be assessed from farmers' point of view followed by follow-up of the disaster management plan is less by officials (86.67%), disaster plan lacks transparency (74.16%) and lack of sufficient knowledge regarding disaster preparedness (65.41%).

Eight statements are divided into positive and negative statements in order to measure attitude in an effective way. The responses were collected in five-point continuum viz, strongly agree, agree, undecided, disagree and strongly disagree.

The above Table 6 presents the distribution of respondents based on their attitude towards disaster management. 76.67% of the respondents are having medium level attitude followed by high (16.67%) and low (6.67%) respectively. The results reveal that majority of the respondents having medium favourable attitude towards disaster management. These findings are in line with the results of Niranjan and Bose [6]. The author reported that majority of the farmers are having medium level of attitude in his study regarding attitude of farmers towards climate resilient practices [15].

Table 1. Computation of equal appearing intervals

Sl. No.	Statement no.	S value	Q value	Difference between the successive scale values	Cumulative value of the difference	Equal appearing class intervals	Compartment
1	32	5.9	1.037				
2	31	5.25	1.094	0.65			
3	57	4.848	0.652	0.402	0.65	0.403	1
4	29	4.75	0.875	0.098	0.747		
5	24	4.667	1.033	0.083	0.831	0.806	II
6	26	4.618	1.059	0.049	0.88		
7	9	4.563	1.181	0.055	0.935		
8	48	4.563	1.031	0	0.935		
9	3	4.5	1.333	0.063	0.997		
10	6	4.5	1.182	0	0.997		
11	15	4.5	1.077	0	0.997		
12	21	4.5	1.182	0	0.997		
13	30	4.4	0.882	0.1	1.097		
14	53	4.367	1.056	0.033	1.131		
15	25	4.278	0.957	0.089	1.22	1.209	III
16	45	4.25	1.25	0.028	1.247		
17	60	4.25	1.25	0	1.247		
18	11	4.227	1.33	0.023	1.27		
19	56	4.167	1.277	0.061	1.331		
20	47	4.143	1.143	0.024	1.354		
21	10	4.125	1.010	0.018	1.372		
22	18	4.125	2.00	0	1.372		
23	50	4.125	1.01	0	1.372		
24	49	4.1	1.818	0.025	1.397		
25	42	4.083	1.5	0.017	1.414		
26	16	4.045	1.438	0.038	1.452		
27	35	4.026	0.789	0.019	1.471		
28	59	3.971	0.882	0.056	1.527		
29	43	3.912	0.953	0.059	1.586		
30	46	3.885	2.033	0.027	1.613	1.612	IV

Sl. No.	Statement no.	S value	Q value	Difference between the successive scale values	Cumulative value of the difference	Equal appearing class intervals	Compartment
31	23	3.875	2	0.01	1.622		
32	20	3.857	1.143	0.018	1.64		
33	55	3.833	1.458	0.024	1.664		
34	54	3.813	2.031	0.021	1.685		
35	36	3.8	2.146	0.013	1.697		
36	37	3.786	1.861	0.014	1.712		
37	39	3.773	1.455	0.013	1.725		
38	40	3.773	1.597	0	1.725		
39	1	3.731	1.974	0.042	1.767		
40	58	3.731	1.708	0	1.767		
41	19	3.722	1.848	0.009	1.775		
42	41	3.7	1.783	0.022	1.797		
43	33	3.688	1.2	0.013	1.81		
44	22	3.571	1.536	0.116	1.926		
45	7	3.5	2.979	0.071	1.997		
46	8	3.5	2.098	0	1.997		
47	14	3.5	1.855	0	1.997		
48	27	3.5	2.127	0	1.997		
49	51	3.5	1.583	0	1.997		
50	17	3.375	1.733	0.125	2.122	2.015	V
51	38	3.375	1.721	0	2.122		
52	34	3.25	1.438	0.125	2.247		
53	52	3.25	1.85	0	2.247		
54	12	3.167	2.006	0.083	2.331		
55	13	3.1	2.02	0.067	2.397		
56	2	2.5	1.958	0.6	2.997	2.418	VI
57	4	2.5	1.667	0	2.997	2.821	VII
58	28	2.389	2.257	0.111	3.108		
59	5	2.389	2.361	0	3.108		
60	44	2.269	1.908	0.12	3.225	3.225	VIII

Table 2. Calculation of class intervals

S. No	Compartments	Interval values
1.	I	0.403
2.	II	0.806
3.	III	1.209
4.	IV	1.612
5.	V	2.015
6.	VI	2.418
7.	VII	2.821
8.	VIII	3.225

Table 3. Final Set of attitude items selected with corresponding Scale and Q values and the nature of the statement

S. No	Statement No	Scale value	Q Value	Statement	Nature of the extent
1	6	4.5	1.181	I feel disaster plans need to be updated regularly	Favourable
2	47	4.142	1.142	I have adequate insurances to tackle the uncertainties	Favourable
3	34	3.25	1.437	I have sufficient information about disaster preparedness and management to address my knowledge gaps	Favourable
4	57	4.847	0.652	I feel disaster related problems should be assessed from the farmers' point of view	Favourable
5	44	2.269	1.907	I received poor government support during the disaster	Unfavourable
6	20	3.857	1.142	Follow-up of the disaster management plan is less by the officials	Unfavourable
7	28	2.388	2.256	Contingency plans are a waste of public funds	Unfavourable
8	2	2.5	1.958	Disaster management plan lacks transparency	Unfavourable

Table 4. Administration of the scale

Nature of the statement	Continuum				
	Strongly Agree	**Agree**	**Undecided**	**Disagree**	**Strongly Disagree**
Favourable	5	4	3	2	1
Unfavourable	1	2	3	4	5

Table 5. Distribution of respondents based on their attitude towards disaster management

S. No	Statement	SA	A	UD	DA	SDA
1	I feel disaster plans need to be updated regularly	86 (35.83%)	118 (49.17%)	31 (12.91%)	5 (2.08%)	0 (0)
2	I feel disaster related problems should be assessed from farmers' point of view	210 (87.5%)	20 (8.33%)	7 (2.91%)	4 (1.67%)	0 (0)
3	Contingency plans are waste of public funds	89 (37.08%)	129 (53.75%)	16 (6.67%)	4 (1.67%)	2 (0.83%)
4	I have sufficient information about disaster preparedness and management to address my knowledge gaps	0 (0)	33 (13.75%)	19 (7.91%)	157 (65.41%)	31 (12.91%)
5	Disaster management plan lacks transparency	48 (20%)	178 (74.16%)	11 (4.58%)	3 (1.25%)	0 (0)
6	I received poor government support during the disaster	84 (35%)	143 (59.58%)	7 (2.91%)	6 (2.5%)	0 (0)
7	I have adequate insurances to tackle the uncertainties	6 (2.5%)	18 (7.5%)	0 (0)	154 (64.17%)	62 (25.83%)
8	Follow-up of the disaster management plan is less by the officials	20 (8.33%)	208 (86.67%)	3 (1.25%)	3 (1.25%)	6 (2.5%)

Table 6. Distribution of respondents based on their attitude level toward natural disaster management

S. No	Attitude level (scores)	Frequency	Percentage
1	Low (<18)	16	6.67
2	Medium (18-24)	184	76.67
3	High (> 24)	40	16.67
Total		240	100

Mean = 21.55, Standard deviation = 2.84

4. CONCLUSION

The results suggest that officials involved in disaster management and rescue operations should concentrate on the above identified areas and also to identify safe places for evacuation during natural disasters. From the above results it is understandable that, the majority of the respondents (76.67%) were having medium favourable attitude towards disaster management and 16.67 per cent of the respondents were had high level of favorable attitude towards natural disaster management. Even though medium level favourable attitude is giving hope for the disaster management officials for better implementation of disaster management programmes, it is necessary to take steps to change the rate of attitude of farmers towards disaster management. It is also important to solve the disaster related problems from farmers' point of view.

5. RECOMMENDATIONS

From the local people to improve the post disaster situation in favor of farmers the respondent recommended that:

- There is no provision for any disaster preparedness training program for the farmers. The training programs are arranged for the officials of different organizations and for the member of disaster management committees and volunteer committees. As a result, the farmers cannot develop their skill to cope with disaster.
- Follow up visits to the flood or cyclone affected areas should be practiced in order to maintain flood or cyclone evacuation centres and secured the affected and vulnerable groups
- NGOs,community based organizations should be integrated in the community

disaster response and rehabilitation planning.

- Comprehensive evaluations of flood and disaster management systems through full disaster cycle are rare so the disaster management system should perform through the disaster cycle is extremely valuable to reduce the risks of the disasters.
- Research on disasters and reduction of their impact should be given priority and the output should be used in policy formulation and project selection

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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Peer-review history:
The peer review history for this paper can be accessed here:
https://www.sdiarticle5.com/review-history/101421