

DEVELOPMENT OF A KNOWLEDGE TEST TO EVALUATE FARMERS' UNDERSTANDING OF CLIMATE-RESILIENT DAIRY FARMING PRACTICES

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ABSTRACT

India has held the title of 'largest producer of milk in the world' for decades. Adoption of climate-resilient dairy practices is of utmost importance in the present scenario of climate variability. The awareness and understanding of the farmers affect the adoption of mitigation practices to combat with impact of climate change. Hence, this study aims to assess the awareness of dairy farmers in selected four districts (stratified random sampling) of Madhya Pradesh, India towards climate-resilient dairy farming practices (n=160) and accordingly develop a knowledge test (n=60) on a five-point continuum. Study data revealed that a major proportion of dairy farmers come under a medium level of awareness score (14.15-19.60) i.e. 55 percent. The study's additional findings showed that, out of the thirty seven items screened for knowledge of climate-resilient dairy practices, twenty two were ultimately chosen based on their difficulty levels, discrimination index, and point bi-serial correlation. The 'Guttman split-half coefficient' validated the final knowledge test on climate-resilient dairy production operations. Numerous researchers observed that insufficient access to information regarding climate change was a major contributing factor to the poor comprehension of the changing climate. This can be used by researchers to gauge farmers' familiarity with 'Climate-Resilient Dairy Farming Practices'.

Keywords: dairy farmers, knowledge test, awareness, climate-resilient practices, climate change

INTRODUCTION

India has held the title of "largest producer of milk in the world" for decades. The government of India consistently implemented productivity enhancement and development programmes to boost milk production. Adoption of climate-resilient dairy practices is utmost important in the present scenario of climate change. As an estimation, in India approx. eight crore rural households are engaged in dairy production (Indiamart, <https://www.indiamart.com>; Hadiana et al., 2019). About 150 million households globally produce milk, according to FAO estimates (Siddiky & Faruque, 2017). Dairy animals' thermoneutral zone (TNZ), which is between 16 and 25 degrees Celsius, allows them to maintain a physiological body temperature between 38.4 and 39.1 degrees Celsius. But in temperate climates, air temperatures over 20–25°C, and in tropical climates like India, 25–37°C, increase heat gain beyond that lost from the body and cause heat stress (Silanokove & Koluman, 2015). As per the 20th livestock census total bovine population of Madhya Pradesh is 29.05 lakhs, and milk production is reached a volume of around 17.99 million tons (3rd rank in India). Madhya Pradesh is considered to be vulnerable (Sehgal et al, 2017),

projected climate risks for the state are increase in maximum and minimum temperature, change in spatial and temporal monsoon, increase in frequency and intensity of rains, loss of rainy days etc (Vinaya and Shivamurthy, 2021). there are natural disaster striking in Madhya Pradesh on regular basis in the form of flood, droughts, heat waves and health related concerns.

The awareness of the farmers leads to adoption of mitigation practices to combat with impact of climate change (Vinaya et al., 2022). As the importance of awareness in adoption process Ghasura et al, (2021) developed the awareness scale to assess the dairy farmer's adoption behavior towards impact of climate change.

Development in a society or community happens only when the society undergoes through functional and structural changes (Vinaya and Tapan, 2023). And these changes happen only when members of society acquire new ways of thinking, new knowledge and exposure of new technology. However, a lack of knowledge leading to use of climate-resilient dairy farming practices to mitigate impact of climate change among Indian dairy farmers remains a

problem (Tajpara et al., 2020; Yeragorla and Seema, 2021). Hence, this study aims to assess the awareness of dairy farmers towards climate-resilient dairy farming practices and accordingly develop knowledge test on climate-resilient dairy farming practices. So that assessment of knowledge of dairy farmers perform in right direction and thus because of knowledge deficiency, farmer's rate of adoption regarding climate-resilient dairy practices is not hampered.

This study highlights the essential steps followed in developing knowledge test to quantify the knowledge level of dairy farmers towards CRDFP. Here, knowledge level of CRDFP is defined as "the assured knowledge and comprehension of dairy farmers in all six domains i.e. climate-resilient feeding, climate-resilient breeding, climate-resilient healthcare, climate-resilient managerial, climate-resilient waste management and lastly miscellaneous climate-resilient practices. Therefore, present study was carried out by under the objective of "construction of knowledge test against climate-resilient dairy practices in selected vulnerable zone of Madhya Pradesh.

OBJECTIVE

To development of a knowledge test to evaluate farmers' understanding of climate-resilient dairy farming practices

METHODOLOGY

Locale of study and sampling plan

Assessment of the awareness level of dairy farmers four districts were selected randomly from the state of Madhya Pradesh. Ten dairy farmers were chosen based on their work experience and herd size from each of the two blocks and two villages that made up each district. (A farmer who has had a minimum herd size of 4 dairy animals for the last 05 years was selected as a sample for the present study). As a result, 160 farmers in all were chosen for this investigation.

Additionally, thirty non-sample respondents from Ghana village and Kailwas village in the Jabalpur block were taken for the preparation of the knowledge test. In order to verify the reliability among thirty new non-sample respondents from the Narsinghpur district, the final knowledge test was introduced. In a part of the study, this developed test was introduced in other regions of Madhya Pradesh to test the knowledge level of dairy farmers.

Assessment of awareness level:

Awareness is the first step when the farmers hear something about any scientific technology. The schedule created by Maiti et al. (2016) for coastal regions was

somewhat modified in the current study to gauge the varying levels of awareness regarding climate change and its impact on livestock output. The program had twelve statements, utilizing a 4-point rating system ranging from 'fully aware' to 'not at all aware,' respondents were requested to rank their responses. They were given the following scores: 3, 2, 1, and 0. Using the cumulative square root frequency method, three categories of farmers were formed depending on their scores: low, medium, and high. This variable was measured through a structured interview schedule.

Construction of Knowledge Test

The CRDFP knowledge test was developed. The knowledge test comprised objective-type questions and was administered to the respondents. After the scores were allocated, the sum total of the individual's scores for every item was used to determine the final score. In accordance, the potential scope of knowledge acquisition was described. The following describes the process used to create the knowledge test:

Collection of items

Items or statements were formulated on breeding, feeding, health care, management, and waste disposal practices of dairy animals pertaining to changing climatic scenarios. Tasks or problems on a test are typically rated in difficulty using established steps or intervals, ranging from very simple to very hard (Garrett, 1966). These issues or assignments are called 'items.' Items make up the knowledge test's material. In order to produce a comprehensive set of tests for climate-resilient dairy farming methods, a thorough review of pertinent literature from books, manuals, compendiums, internal sources, NICRA KVK, and expert consultation was conducted. Based on the following criteria, the viability and durability of these knowledge items were assessed:

- (I) It ought to stimulate thought.
- (ii) It ought to be somewhat challenging; and
- (iii) It ought to distinguish the learned from the ignorant.

The first test battery for 'item analysis' consisted of a set of thirty-seven raw items that covered the majority of the topics linked to climate-resilient dairy farming techniques. To make scoring easier, the test components were changed into true dichotomous (yes/no) objective-type questions.

Pre-testing and Item Analysis-

Thirty respondents were given the preliminary knowledge test from the Jabalpur district's non-sampling

region. After assigning 1 and 0 points, respectively, for right and wrong responses, each respondent's overall score was determined by adding up all of his or her points from all of the items. Dairy farmers who were actively involved in dairy farming activities were selected for the purpose. All 37 items were screened to the dairy farmers in different formats as open-ended, true/false types to know the knowledge levels of farmers in an accurate way as much as possible. A Score of 1 was given when the response was correct and 0 for the incorrect response. Following that, each item's 'Difficulty Index' and 'Discrimination Index' were determined independently. Since the knowledge test contained actual dichotomy items, point bi-serial correlation was computed for item analysis (Ray & Mondal, 2014).

Difficulty Index

The ' D_i ' of a given item indicates how frustrated respondents are, in relation to answering the item or question correctly. Here assuming that the level of knowledge is linearly related to the difficulty of the items concerned. The following formula was used to get "the D_i ":

$$D_i = n_i/N$$

Where, D_i = i^{th} Item Difficulty Index,

N_i = No. of respondents who answered the question correctly of i^{th} Item

N = Total no. of respondents

Ultimately, in accordance with Atthouse (2000), the test's final items were chosen from those scoring between 0.30 and 0.90.

Discrimination Index

The Discrimination Index is a statistical tool used to quantify the degree to which a given item favors respondents with significantly more knowledge of the subject over those with less knowledge. Following the computation of the total score on 37 items for each of the 30 repliers, the rankings of the scores were from highest to lowest. This was used to split the 30 responders into 6 comparable groups called G1, G2, G3, G4, G5, & G6, and each included five responders. After the intermediate two groups (G3 and G4) were eliminated for item analysis, high & poor scores were divided into four extreme groupings—remaining. The item discrimination index, which is determined by the formula, is denoted by the ' $E^{1/3}$ ' methods Srinivas et al., (2014).

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

where the frequencies of the right responses in the groups G1, G2, G5, & G6 are represented, respectively, by S1, S2, S5, & S6. The letter 'N' represents the thirty respondents who made up the sample chosen for item evaluation. The range of the discrimination index is 0 to 1. For the ultimate test, items with discriminating indices between 0.30 & 0.85 were chosen.

Point-bi-serial Correlation Coefficient

Statistics that show the link between the total score and a dichotomized response for each individual item. They are used to assess the internal consistency of dichotomous or binary items. The point bi-serial correlation was determined for each question in the first knowledge test using the formula given by Garret (1966).

$$r_{bp} = \frac{M_p - M_q}{SD} X \sqrt{pq}$$

where, r_{bp} = point bi-serial correlation

M_p = total mean score of the respondents who give correct answer.

$$M_p = \frac{\text{Sum total of } xy}{\text{Total number of correct answers}}$$

M_q = total mean score of the respondents who give incorrect answer.

$$M_q = \frac{\text{Sum total of } x - \text{Sum total of } xy}{\text{Total number of incorrect answers}}$$

p = proportion of the respondents given a correct answer to the item

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

q = proportion of the respondents given incorrect answers to the item

$$Q = 1 - P$$

SD = standard deviation of the entire sample

X = Total score of the respondent for all items.

Y = Response of the individual for the items i.e. (Correct = 1; Incorrect = 0)

XY = multiplied by the respondent's overall score after the item's response. That is, (Inaccurate = 0; Correct = 1). For the final knowledge test, items with substantial point biserial correlation at the 1 percent (or 5%) level were chosen.

Final selection of Items

The items that were ultimately chosen for the knowledge test had a discrimination index value ranging from 0.30 to 0.85, a point bi-serial correlation coefficient at the five and one percent significance level, and a DI between 0.30 and

0.90. These products met every one of the prerequisites. It was carefully considered to ensure that the test items chosen ultimately encompassed all of the respondent’s knowledge of climate-resilient dairy production practices. Consequently, for the final knowledge test, a total of 22 items (Table 3) out of a total of 37 items (Tables 1 & 2) were kept.

Table 01: Item analysis of selected items under knowledge test of climate-resilient dairy farming practices

Sr. No.	Practices	Difficulty index	Discrimination index	Point biserial correlation coefficient
A.	Climate-resilient feeding practices			
1.	Do you reduce dietary fiber intake during summer or heat stressed condition?	0.600	0.390	0.416*
2.	Do you increase the amount of concentrate in the ration during heat stress?	0.910	0.012	0.412
3.	Do you supplement animal’s diet with fat (eg: by pass fat/ whole/crushed oilseeds) during heat stress?	0.419	0.391	0.365*
4.	Do you add feed additives like buffer (sodium bicarbonate), antioxidants (vit. A and E), yeast culture, niacin/ or mineral mixture, vitamin yeast culture combined formulation during heat stress?	0.812	0.310	0.631**
5.	Do you give your animal strategic supplements like UMBs?	0.944	0.120	0.227
6.	Do you know the climate-resilient crop or fodder variety? OR fodder used for growing during draught/high temperature?	0.567	0.452	0.450*
7.	Do you supplement animal’s feed with alternate acceptors like sodium sulphate @ 1-2 gm per kg of ration?	0.901	0.032	0.760
8.	Do you provide fresh and cool water to animal during heat stress?	0.610	0.639	0.740**
9.	Do you soak the concentrate into equal amount of water before feeding it to animals?	0.512	0.760	0.186
10.	Do you increase the frequency of feeding and feed the animals during cool hours of day during heat stress?	0.765	0.218	0.312
11.	Do you know the process of green fodder processing	0.228	0.310	0.489
12.	Do you know the crop suitable for silage making	0.504	0.471	0.631**
B.	Climate-resilient breeding practices			
13.	Do you select breeds of animals according to the local environment and farming system?	0.689	0.481	0.781**
14.	Which breeding strategy is useful for strengthening our indigenous breeds from the view of conserving our local biodiversity?	0.653	0.448	0.514*
15.	Which practice of breeding should be followed in animals so as reduce the chance of any kind of contamination/disease transfer?	0.367	0.610	0.309**
16.	Which of the practice increase the conception rate in dairy animals	0.466	0.340	0.516**
C.	Climate-resilient health care practices			
17.	Do you isolate sick animals from the healthy ones in a separate house/shed?	0.867	0.700	0.549*
18.	Do you conduct disease testing programme for important disease like mastitis, brucellosis, etc. on quarantined animal as well as for other animals in the shed?	0.021	0.068	0.196
19.	Do you follow proper premises management and sanitation practices like cleaning, disinfection and white washing of the shed?	1	0	0
20.	Do you vaccinate all the animals of the herd as per recommended schedule?	0.540	0.365	0.391*
21.	Do you go for parasite control measures like deworming and ectoparasite control?	0.439	0.400	0.379*
22.	Do you know that in which season high incidence of mastitis happen ?	0.544	0.761	0.699**
23.	What can be used for reducing the incidence of mastitis?	0.435	0.655	0.543*
D.	Climate-resilient management practices			
24.	Do you have proper drainage facilities in the farm?	1	0	0.319
25.	Do you provide footbath at the entrance of the shed?	1	0	0

Sr. No.	Practices	Difficulty index	Discrimination index	Point biserial correlation coefficient
26.	Physical protection and shelter management practices for protecting animals from extreme climatic conditions	0.738	0.401	0.810*
27.	Do you paint the roof with radiating paints white outside and black inside during summer?	0.567	0.375	0.731*
28.	Do you sprinkle upper body of the animal with water during summer 2-3 times daily?	0.766	0.460	0.421
29.	Do you provide bedding materials like thick dry straw etc. at the resting areas to provide insulation from cold?	1	0	0
30.	Do you cover young calves with blanket (gunny bag) during winter?	0.675	0.490	0.654**
E. Climate-resilient waste management practices				
31.	Do you maintain a proper manure pit for storage and treatment of farm waste?	1	0	0
32.	Do you utilize farm waste for biogas plant composting?	0.619	0.605	0.331*
33.	Do you go for making dung cakes/vermicomposting?	0.900	0.630	0.691*
34.	Do you use covers for manure and waste water storage?	1	0	0
F. Climate-resilient other practices				
35.	Use of unconventional resource of feed	0.469	0.120	0.450
36.	How do you dispose animal's carcasses? (burial)	0.633	0.600	0.631*
37.	Knowing of weather forecast	0.613	0.544	0.532*

Table 02: Selected Item with their difficulty, discrimination and point bi serial correlation value analysis

Sr. No.	Practices	Difficulty index	Discrimination index	Point biserial correlation coefficient
A. Climate-resilient feeding practices				
1.	Do you reduce dietary fiber intake during summer or heat stressed condition?	0.600	0.390	0.416*
3.	Do you supplement animal's diet with fat (eg: by pass fat/ whole/crushed oilseeds) during heat stress?	0.463	0.391	0.365*
4.	Do you add feed additives like buffer (sodium bicarbonate), antioxidants (vit. A & E), yeast culture, niacin/ or mineral mixture, vitamin yeast culture combined formulation during heat stress?	0.812	0.310	0.631**
6.	Do you know the climate-resilient crop or fodder variety? OR fodder used for growing during draught/high temperature?	0.567	0.452	0.450*
8.	Do you provide fresh and cool water to animal during heat stress?	0.610	0.639	0.740**
12.	Do you know the crop suitable for silage making?	0.504	0.471	0.631**
B. Climate-resilient breeding practices				
13.	Do you select breeds of animals according to the local environment and farming system?	0.689	0.481	0.781**
14.	Which breeding strategy is useful for strengthening our indigenous breeds from the view of conserving our local biodiversity?	0.653	0.448	0.514*
15.	Which practice of breeding should be followed in animals so as reduce the chance of any kind of contamination/disease transfer?	0.367	0.610	0.309**
16.	Which of the practice increase the conception rate in dairy animals	0.466	0.340	0.516**
C. Climate-resilient health care practices				
17.	Do you isolate sick animals from the healthy ones in a separate house/shed?	0.867	0.700	0.549*
20.	Do you vaccinate all the animals of the herd as per recommended schedule?	0.540	0.365	0.391*

Sr. No.	Practices	Difficulty index	Discrimination index	Point biserial correlation coefficient
21.	Do you go for parasite control measures like deworming and ectoparasite control?	0.439	0.400	0.379*
22.	Do you know that in which season high incidence of mastitis happen	0.544	0.761	0.699**
23.	What can be used for reducing the incidence of mastitis?	0.435	0.655	0.543*
D. Climate-resilient management practices				
26.	Physical protection and shelter management practices for protecting animals from extreme climatic conditions	0.738	0.401	0.810*
27.	Do you paint the roof with radiating paints white outside and black inside during summer?	0.567	0.375	0.731*
30.	Do you cover young calves with blanket (gunny bag) during winter?	0.675	0.490	0.654**
E. Climate-resilient waste management practices				
32.	Do you utilize farm waste for biogas plant composting?	0.619	0.605	0.331*
33.	Do you go for making dung cakes/vermicomposting?	0.900	0.630	0.691*
F. Climate-resilient other practices				
36.	How do you dispose animal's carcasses? (burial)	0.633	0.600	0.631*
37.	Knowing of weather forecast	0.613	0.544	0.532*

Table 03: Developed knowledge test for dairy farmers to climate-resilient dairy farming practices

Sr. No.	Selected items	Score
1	Do you change dietary fiber intake during summer or heat stressed condition? Increase Decrease	0 1
2	Do you supplement animal's diet with fat during heat stress? By pass fat/ whole/crushed oilseeds Any other	1 0
3	Do you add feed additives combined formulation during heat stress? Buffer (sodium bicarbonate), antioxidants (vit. A and E), yeast culture, niacin/ or mineral mixture, vitamin yeast culture Any other	1 0
4	Do you provide fresh and cool water to animal during heat stress? (Yes/No)	1 0
5	Do you know the crop suitable for silage making? Leguminous crop Non-leguminous crop	0 1
9	Do you know the climate-resilient crop or fodder variety? (Yes/No)	1 0
7	Do you select breeds of animals according to the local environment and farming system? i. Crossbreds ii. Indigenous breeds iii. Exotic breeds	0 1 0
8	Which breeding strategy is useful for strengthening our indigenous breeds from the view of conserving our local biodiversity? Grading up/ selective breeding (1) Crossbreeding (0)	1 0

Sr. No.	Selected items	Score
9	Which practice of breeding should be followed in animals so as reduce the chance of any kind of contamination/disease transfer? i. Natural Service ii. Artificial insemination	0 1
10	Which of the practice increase the conception rate in dairy animals? Feeding of mineral mixture @ 60gm/day and deworming twice in a year Use of dewormer Spray of insecticide	1 0 0
12	Do you isolate sick animals from the healthy ones in a separate house/shed? (Yes/No)	1 0
13	Do you vaccinate all the animals of the herd as per recommended schedule in cool hours? (Yes/No)	1 0
14	Do you go for parasite control measures like deworming and ectoparasite control? (Yes/No)	1 0
15	Do you know that in which season high incidence of mastitis happen? Winter Hot humid weather Rainy	0 1 1
16	What can be used for reducing the incidence of mastitis? Mineral mixture feeding Albendazole Feeding of 2 gm Vitamin E and Selenium	0 0 1
17	Do you provide physical protection and shelter management practices for protecting animals from extreme climatic conditions? Provide shed /proper ventilation/sprinkler, mister etc. Any other	1 0
18	Do you paint the roof with radiating paints white outside and black inside during summer? (Yes/No)	1 0
19	Do you cover young calves with blanket (gunny bag) during winter? (Yes/No)	1 0
20	Do you utilize farm waste for biogas plant composting? (Yes/No)	1/0
21	Do you go for making dung cakes/vermicomposting? (Yes/No)	1/0
22	How do you dispose animal's carcasses? Burial Any other	1 0
23	Knowing of weather forecast (Yes/No)	1/0

Reliability testing and validity of knowledge test

Reliability statistics of the knowledge test indicate the consistencies when applied to the matched sample. The final set of the 22 statements which represent knowledge test was administered on a two-point continuum to a fresh group

of 30 farmers of non-sample area i.e. dairy farmers from Narsinghpur district. The case processing summary (Table 4) was calculated to check the valid responses from 30 non-sample farmers. None of the responses was excluded and found valid.

Table 4: Case processing Summary

		n=no. of respondents	Percentage
Cases (Responses from non sample farmers)	Valid Responses	30	100.0
	*Excluded Responses	00	000.0
	Total	30	100.0
*List wise deletion based on all variables in the procedure			

Further, validity of developed test was assessed by expert’s opinion who have working experience in the field of climate change impact and climate-resilient dairy farming practices. Split half method was applying to calculate the reliability coefficient as suggested by Garrett, (2007) and measured by calculating the ‘Spearman Brown’ reliability coefficient as follows:

$$r_c = \frac{2r}{1+r}Fu$$

Where,

rc = Spearman Brown reliability coefficient of the whole test and

r = Reliability coefficient of the half test

The coefficient of correlation between forms (odd and even items) was 0.870 and ‘Spearman Brown Coefficient’ for both equal length and unequal length was 0.821 (Table 5), thus showing high reliability of the knowledge test.

Table 5: Reliability Statistics

	Total numbers of items	22
Correlation between forms		0.870
Spearman brown coefficient	Equal length	0.821
	Unequal length	0.821
Guttman split half coefficient		0.850

In next, developed knowledge test was introduced among actual respondents of the study.

RESULT AND DISCUSSION

Awareness of farmers towards climate change

In order to adapt to the changing climate scenario, it was first necessary to raise public awareness through the use of mass media, and then use trained extension agents to make individual contacts with people (Sarkar & Padaria, 2010). According to research by Ado et al. (2019), farmers’ perceptions of climate change’s impacts & the degree of community awareness are key factors in effective adaptation to the phenomenon. Using the cumulative square root

frequency approach, the farmers were grouped into three groups: low, medium, and high, based on their score.

Table 06: Categorization of the respondents as per their level of awareness regarding climate change and its impact on livestock (n=160)

Category	Frequency	Percentage
Low (08.00-14.14)	45	28.13
Medium (14.15-19.60)	88	55.00
High (19.61-24.42)	27	16.87
Mean	16.98	
SD	2.14	

The data in Table 6 clearly show that 55.00 percent of the farmers had a medium awareness level. 28.13 and 16.87 percent of the farmers, respectively, showed lower and greater levels of awareness. Findings of Dietz et al., 2007 revealed that only 9 percent of the farmers were aware of climate change. A study by Baul et al., (2013) reported that 84 percent of the farmers feel an increase in temperature. Adebayo et al. (2012) and Codjoe et al. (2013) reported similar results, indicating that farmers knew about climate change and its numerous effects on their farming practices. Furthermore, several studies (Thinda et al., 2021; Zerssa et al., 2021; Mekonnen et al., 2021; Mekuvie & Mulu, 2021; Below et al., 2015; Belay et al., 2017; Etana et al., 2021) have made an effort to gauge the knowledge of farmers about how climate variability is affecting farming and how they are responding to it. Findings of Mustafa et al, (2023), noticed that climate change adaptation is a significant predictor of adaptation to climate change. Further, Fahad, et al., (2020), results exposed that 73 % of farm households were aware of climate change whereas a study by Madamombe et al, (2024) revealed that farmers were aware of and had experienced extreme weather events. A study conducted in the Rumphi area of Malawi by Munthali et al. (2016) discovered that although small farmers had a reasonably high knowledge of climate change, their relative grasp of the phenomenon was still out of step with its effects. The results of Ishaya and Abaje (2008) show that the farmers in Jena, Nigeria, lack awareness and information regarding climate change. Numerous researchers

observed that insufficient access to information regarding climate change was a major contributing factor to the poor comprehension of the changing climate.

Knowledge test of dairy farmers against climate change

Out of 12 raw statement six knowledge items were chosen for the subtopic of climate-resilient feeding practices following preliminary screening, these items had difficulty index value between 0.30 and 0.90 and discrimination index value between 0.30 and 0.85 and a relevant value of point bi-serial correlation coefficient (Table 1). Similarly, the number of knowledge item selected out of 4 raw items under the subtopic climate-resilient breeding practices after preliminary screening is four; these items had a difficulty index between 0.30 and 0.90 and discrimination index value between 0.30 and 0.85 and a relevant value of point bi-serial correlation coefficient (Table 1). Furthermore, following the same criteria knowledge items selected for subtopic 'climate-resilient health care practices', 'climate-resilient management practices', 'climate-resilient waste management practices' and 'climate-resilient other practices' are five, three, two and two respectively (Table 1) and (Table 2). Lastly, a sum of 22 items out of 37 raw knowledge items were kept to form the standardized knowledge test on the topic CRDFP.

CONCLUSION

Knowledge is regarded as the essential element in three domains of educational activity (Bloom *et al.* 1956). This has a significant impact on farmers' behavior patterns, thus it's important to grasp the farming community's current knowledge level in order to engage them in any unsettled or unresolved topic pertaining to them. In light of this, a reliable and valid knowledge test on CRDFP was created, attempting to cover every conceivable and well-liked topic related to CRDFP. Researcher can use this to test the knowledge level of farmers towards Climate-resilient Dairy Farming Practices. As the multifaceted view of knowledge management, researchers agree that the most significant practices are acquisition, sharing and application of knowledge (Al-sa'di *et al.*, 2017; Al-emran *et al.*, 2018; Ode & Ayavoo, 2020). Therefore, it is critical to know the climate-resilient dairy farming practices knowledge among dairy farmers that help in formulate need based policy and also to create alertness among farmers. This increased knowledge level can prevent the animals from impact of climate change which will benefit animal health and the income of farmers ultimately

Recommendation/Policy implication:

The initial crucial steps in farmers' adoption of climate-resilient practices are their awareness and knowledge

(Pokiya *et al.*, 2024). The present paper suggests important indicators by which dairy farmers' knowledge can be judged, and concerned institutes and agencies can decide to make further improvements. Therefore, farmers' adoption levels can be upgraded in the field.

Statements

Availability of data and material:

The data set generated during and/or analyzed during the current study are available from the corresponding author upon reasonable request and with the permission of the Department of Veterinary Extension, NDVSU, Jabalpur M.P.

COMPETING INTERESTS

The author(s) declares that they have no conflicts of interest regarding this paper.

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