

A SCALE TO MEASURE THE ATTITUDE OF DAIRY FARMERS TOWARDS SCIENTIFIC REARING PRACTICES OF CALVES

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ABSTRACT

At present, low productivity of dairy animals and high calf mortality are major challenges affecting the sustainability and profitability of dairy farming. These issues reduce the economic returns of farmers due to poor growth, health, and survival of calves. Scientific rearing practices play a crucial role in improving calf health, growth, and future productivity of dairy animals. However, the adoption of these practices largely depends on the attitude of dairy farmers. A favourable attitude can enhance adoption, while an unfavourable attitude may hinder the use of improved practices. Thus, it is essential to study the attitude of dairy farmers towards scientific rearing practices of calves. A scale has been constructed to measure the attitude of dairy farmers towards scientific rearing practices of calves using the Scale Product Method, which combines equal appearing interval technique for item selection and summated rating technique for measuring responses. The process involved identification of relevant aspects, collection and editing of statements, and analysis through judges' rating. A total of 24 statements were initially selected, out of which 15 statements were finally included in the scale. The scale was tested for reliability using the split-half method and was found to be highly reliable. Content validity was ensured through expert evaluation. The final scale consists of fifteen statements and was found to be reliable and valid.

Keywords: attitude, Dairy farmers, Scientific rearing practices

INTRODUCTION

India is an agrarian country where a large proportion of the population depends on agriculture and allied sectors for their livelihood. According to the Census of India (2011), more than half of the country's population is engaged in agriculture and allied activities. The agriculture and allied sectors contribute 17.8 % to the national Gross Value Added (GVA) during 2023–24, of which animal husbandry contributes 5.5 % (Anonymous, 2025). Livestock plays an important role in livelihood security, nutritional support, employment generation, and the development of allied industries such as dairy, feed, and leather industries. India possesses the largest livestock population in the world with 535.8 million animals, including 302.3 million bovines (Anonymous, 2019), and ranks first in global milk production. Despite this achievement, the productivity of dairy animals remains low due to poor management practices, inadequate nutrition, and improper healthcare. Scientific calf rearing is considered essential for improving the future productivity and health of dairy animals (Mahammad *et al.*, 2022). Proper feeding, housing, sanitation, and healthcare during the calf stage help in achieving better growth and reducing mortality.

The neonatal period is highly critical because calves undergo important physiological and metabolic adaptations after birth (Davis and Drackley, 1998). Moreover, higher mortality during the early stage of life has been reported by Bilal *et al.* (2009). Newborn calves are also highly susceptible to diseases due to their immature immune system and therefore require proper scientific care (Maousami *et al.*, 2013). Although several scientific calf rearing practices are available, their adoption largely depends upon the attitude of dairy farmers. Therefore, the present study was undertaken to develop a standardized scale to measure the attitude of dairy farmers towards scientific rearing practices of calves.

OBJECTIVE

To develop and standardize a scale to measure the attitude of dairy farmers towards scientific rearing practices of calves

METHODOLOGY

Attitude means the degree of “positive or negative feelings associated with some psychological objects” (Thurstone, 1946). The “Scale Product Method” technique

was used to develop the attitude scale of dairy farmers towards scientific rearing practices of calves. It is most widely used method to develop an attitude scale. This method combines Thurstone's technique (1928) of equal appearing interval scale for selection of items and Likert's technique (1932) of summated rating for ascertaining the response on the scale as proposed by Eysenck and Crown (1949). With this, an effort has been made to develop an attitude scale which measures dairy farmers' attitudes about scientific rearing practices of calves. Similar procedures are followed by Harikrishna *et al.* (2021), Bhabhor *et al.* (2022), Patel *et al.* (2022), Maheswaran and Pandya (2022) and Shah *et al.* (2023); Patil *et al.* (2025); Rajput *et al.* (2025); Yadav *et al.* (2025).

RESULTS AND DISCUSSION

The following procedure was followed to develop and standardize the scale to measure the attitude of dairy farmers towards scientific rearing practices of calves.

Steps in the development of the attitude scale

Item selection

The first and foremost step towards developing an attitude scale is the selection of statements or items. In the attitude scale, items making up an attitude are known as statements. A statement is defined as a sentence that says something about a psychological object. In the initial phase, a large number of statements related to a feeling of dairy farmers about scientific rearing practices of calves were gathered from relevant literature, discussion with extension educationists and livestock production management experts. The gathered statements were edited according to the criteria suggested by Edwards (1957). Finally, 24 non ambiguous statements were selected for the succeeding procedure of the development of a scale. The selected statements are presented in Table 1.

Judges' rating on attitudinal statements

In order to judge the degree of 'most relevant' to 'most irrelevant' of each and every statement five-point equal appearing interval continuum, a panel considering 50 judges were selected. The selected statements for measuring the attitude of dairy farmers towards scientific rearing practices of calves were sent to the experts of social science, veterinary science and extension education. The judges were requested to give their judgement in five-point equal appearing continuums of agreement, i.e., most relevant, relevant, neutral, irrelevant and most irrelevant for each statement.

Determination of scale value and quartile value

The five points of the rating scale were allocated

with a score ranking from 1 for most irrelevant and 5 for most relevant. Based on 50 judges' judgements, the median value or scale value (S value) and the Quartile (Q) value for the statement were calculated with the help of the below formula.

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

Where,

S = The median or scale value of the statements

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

$\sum P_b$ = The sum of the proportion below the interval in which the median falls

P_w = 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 (one)

The 25th centile (C_{25}) was obtained by the formula.

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

Where,

C_{25} = The median or scale value of the statements

L = Lower limits of the interval in which 25th centile falls

$\sum P_b$ = The sum of the proportion below the interval in which 25th centile falls

P_w = The proportion within the interval in which 25th centile falls

i = The width of the interval and is assumed to be equal to 1.0 (one)

The 75th centile (C_{75}) was obtained by the following formula.

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

Where,

C_{75} = The median or scale value of the statements

L = Lower limits of the interval in which C_{75} centile falls

$\sum P_b$ = The sum of the proportion below the interval in which C_{75} centile falls

P_w = The proportion within the interval in which C_{75} centile falls

i = The width of the interval and is assumed to be equal to 1.0 (one)

The interquartile range was worked out by taking the difference between C_{75} (Q3) and C_{25} (Q1), which means $Q = C_{75} - C_{25}$ for each statement presented in Table 1. After that S value and Q value of each statement were used

to decide whether the particular statement should be a part of the attitude scale or not. Statements with greater median values were selected. Thus all 24 statements were selected in the first phase of selection to include in the attitude scale.

Thurstone and Chave, (1928) suggested another criterion in addition to interquartile range for rejecting statements in scale constructed by the method of equal appearing intervals. Accordingly, when a few statements have the same scale value, statement with the lowest interquartile

range value was selected. As was shown in Table 1, statement no 1 and 2 have an equal scale value of 1.33, but Q value in the case of statement number 2 is 0.94, which is lower than Q value of statement number 1 (0.98). Thus, statement number 2 was finally selected in the second criterion of selection of statements to include in the scale. Based on the S values and Q values, 15 statements numbering 2, 3, 4, 6, 8, 9, 14, 15, 16, 17, 18, 19, 20, 23 and 24 of the original lists were finally selected to constitute attitude scale to measure the attitude of dairy farmers towards scientific rearing practices of calves.

Table 1: Method for selecting the statements for the scale based on scale value and interquartile range

Sr. No.	Statement number	Statement	S value	Q value	Selected / Not selected
1	1	Scientific calf rearing practices are fundamental to modern dairy farming. (+)	1.33	0.98	Not selected
2	2	Scientific calf rearing practices are essential for making dairy farming more profitable. (+)	1.33	0.94	Selected
3	3	I believe that scientific calf rearing practices improve the health of animals. (+)	1.58	1.05	Selected
4	9	I believe in scientific calf rearing practices. (+)	1.8	1.05	Selected
5	15	Scientific calf rearing practices are helpful in the economic growth of dairy farmers. (+)	1.67	0.98	Selected
6	22	I think that adoption of scientific rearing practices of calves improves the economic condition of farmers. (+)	1.73	1.06	Not selected
7	17	I believe that the adoption of scientific calf rearing practices reduces veterinary expenses. (+)	1.73	0.98	Selected
8	21	I feel that scientific rearing practices of calves are feasible for even common farmer. (+)	1.73	1.0	Not selected
9	10	Adoption of scientific calf rearing practices is not risky. (+)	1.87	1.05	Not selected
10	24	Even if I don't get government aid, I have no problem in adopting scientific rearing practiced of calves. (+)	1.87	1.0	Selected
11	7	Continuous improvement through scientific calf rearing practices is a core principle in dairy farming. (+)	1.92	1.07	Not selected
12	18	I am satisfied with the overall outcomes of my efforts in scientific calf rearing practices. (+)	1.92	0.91	Selected
13	4	Adoption of scientific calf rearing practices is difficult. (-)	2.37	2.31	Selected
14	8	I think that scientific calf rearing practices are too costly to implement. (-)	2.7	2.18	Selected
15	19	I dislike advising anybody to adopt scientific calf rearing practices. (-)	3.1	2.35	Selected
16	6	Scientific calf rearing practices are only educated dairy farmer's custom. (-)	3.2	1.98	Selected
17	20	Scientific rearing practices of calves are a risky venture. (-)	3.35	2.49	Selected
18	12	I understand that scientific rearing practices of calves are expensive. (-)	3.55	2.37	Not selected
19	16	I think that scientific calf rearing practices in dairy farming are unreliable practice. (-)	3.55	2.22	Selected
20	13	Scientific calf rearing practices require high investment. (-)	3.55	2.31	Not selected
21	5	I think adoption of scientific calf rearing practices is a waste of money. (-)	3.64	2.54	Not selected
22	11	I feel that scientific calf rearing practices are unprofitable to dairy farming. (-)	3.64	2.66	Not selected
23	14	Scientific calf rearing practices are beneficial for only the big farmers. (-)	3.64	2.23	Selected
24	23	I believe that scientific rearing practices of calves are not viable for small farmers. (-)	3.71	2.22	Selected

Reliability of attitude scale

A scale is considered reliable when it consistently produces the same values when it is applied to the same sample. Split half method was used to determine reliability of attitude scale. The 15 statements were divided into two halves, with 8 odd-numbered in one half and 7 even-numbered statements in the other. Thirty dairy farmers were asked to give their opinions. Each of the two sets of statements was treated as a separate scale, and then these two sub-scales were correlated. Rulon's formula (Guilford, 1954) was used to calculate the coefficient of reliability for scale, which came to be 0.743. Reliability is directly related to the length of the scale when split into odd and even number items. The reliability coefficient which has been calculated is the value of half size of the original scale. In the case of finding reliability using the split-half method, an investigator needs to apply correction factor to consider the final value of reliability. In this scale, it was found to be 0.85. Hence scale was found highly reliable.

Rulon's formula:

$$r_{tt} = 1 - \frac{\sigma^2_d}{\sigma^2_t}$$

$$\sigma^2_d = \frac{\sum d^2 - \frac{(\sum d)^2}{n}}{n}$$

$$\sigma^2_t = \frac{\sum t^2 - \frac{(\sum t)^2}{n}}{n}$$

Where,

r_{tt} = coefficient of reliability

σ^2_d = Variance of difference

σ^2_t = Variance of total score

The correction factor can be calculated by using spearman-brown formula.

Where,

r_{tt} = coefficient of the reliability of original test

r_{oe} = Reliability of coefficient of odd and even score

Content validity of the attitude scale

The validity of a test depends upon the fidelity with which it measures what it is purported to measure (Kerlinger, 1976). The validity of the scale was examined for content validity by determining how well the content of the scale was selected by discussing with experts of extension, livestock production management and other academicians of Kamdhenu University. Therefore, the present scale satisfied content validity.

Administration of the scale

Finally, 15 selected statements were randomly arranged in the final format so that bias could be avoided during the collection of responses, as shown in Table 2. Out of the 15 selected statements, 7 statements were positive and had the indicators of a favorable attitude and 8 statements were negative and had an unfavorable attitude. Against these 15 statements, there were five columns representing five-point continuum of agreement and disagreement to the statements as followed by Likert (1932) in his summated rating technique of attitude measurement. The five points on the continuum were strongly agree, agree, undecided, disagree and strongly disagree with respective weights of 5, 4, 3, 2 and 1 for the positive statements and with respective weights of 1, 2, 3, 4 and 5 for negative statements. The final score was calculated by summing the score obtained by the dairy farmers for all statements, ranging from 20 to 100.

Table 2: Scale to measure attitude of dairy farmers towards scientific rearing practices of calves

Sr. No.	Statements	SA	A	UD	DA	SDA
1	Scientific calf rearing practices are essential for making dairy farming more profitable. (+)					
2	I think that scientific calf rearing practices are too costly to implement. (-)					
3	Scientific calf rearing practices are only educated dairy farmer's custom. (-)					
4	Scientific calf rearing practices are helpful in the economic growth of dairy farmers. (+)					
5	I think that scientific calf rearing practices in dairy farming are unreliable practice. (-)					
6	Even if I don't get government aid, I have no problem in adopting scientific rearing practices of calves. (+)					

Sr. No.	Statements	SA	A	UD	DA	SDA
7	I believe that scientific rearing practices of calves are not viable for small farmers. (-)					
8	Adoption of scientific calf rearing practices is difficult. (-)					
9	I believe that scientific calf rearing practices improve the health of animals. (+)					
10	I dislike advising anybody to adopt scientific calf rearing practices. (-)					
11	I believe in scientific calf rearing practices. (+)					
12	Scientific rearing practices of calves are a risky venture. (-)					
13	I believe that the adoption of scientific calf rearing practices reduces veterinary expenses. (+)					
14	Scientific calf rearing practices are beneficial for only the big farmers. (-)					
15	I am satisfied with the overall outcomes of my efforts in scientific calf rearing practices. (+)					

SA = Strongly Agree, A = Agree, UD = Undecided, DA = Disagree, SDA = Strongly Disagree

CONCLUSION

An attitude scale was constructed to measure the attitude of dairy farmers towards scientific rearing practices of calves with the help of 'Scale Product Method' which blends Thurstone's technique of equal appearing interval scale for items selection and Likert's technique of summated rating. The scale constructed to measure the attitude of the dairy farmers towards scientific rearing practices of calves, consisting of 15 statements, was found valid and highly reliable.

IMPLICATION

The developed reliable and valid attitude scale can help researchers and extension workers assess farmers' attitude, enabling targeted interventions to improve adoption of scientific calf rearing practices, thereby enhancing calf survival, productivity, and overall dairy farm profitability.

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CONFLICT OF INTEREST

All authors declare that they have no conflict of interest.

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