



Development of a Standardised Scale to Measure Farmers' Attitude towards Indigenous Cattle Conservation: A Methodological Approach

Salam Prabex¹, Saidur Rahman^{2*}, Harideep Verma³ and Vimla Saran⁴

^{1,3,4}Ph.D. Scholar, Division of Extension Education, ICAR-Indian Veterinary Research Institute, Izatnagar-243122, Uttar Pradesh, India

²Professor, Department of Veterinary and Animal Husbandry Extension Education, College of Veterinary Sciences and Animal Husbandry, CAU, Selesih, Aizawl, Mizoram, India

*Corresponding author email id: saidur14@rediffmail.com

HIGHLIGHTS

- The 20 out of 36 attitude statements met selection criteria, showing their relevance towards indigenous cattle conservation.
- Both positive and negative statements were included as key dimensions of the scale.
- Cronbach's alpha value exceeded 0.80, indicating high internal consistency and thus testify the reliability of the scale

ARTICLE INFO

Keywords: Cronbach's alpha, Mean relevancy score, Native cattle, Relevancy weightage, Reliability, Spearman brown, Validity.

<https://doi.org/10.48165/IJEE.2025.613RT01>

Conflict of Interest: None

Research ethics statement(s):

Informed consent of the participants

ABSTRACT

The standardized scale was developed to measure farmers' attitudes towards the conservation of indigenous cattle in 2023 in the Bareilly district of Uttar Pradesh state. A total of 55 items were subjected to experts for relevancy testing, and finally, 36 items were selected for item analysis. These 36 items were presented to 42 respondents from other than the study area. The item analysis score was performed using Likert's rating technique of measurement, and t values were calculated for each item. Finally, 20 items were selected and were standardized by establishing their reliability (split-half method) and validity (content validity). The overall test reliability (using Spearman Brown formula), Cronbach's alpha value, and overall content validity index were 0.791, 0.829, and 0.930, respectively. Thus, the reliability and validity of the current scale indicate its consistency and precision of the results. The developed scale will help the researchers in assessing the attitude of farmers towards the conservation of indigenous cattle within a defined target population. Additionally, it will facilitate the development of evidence-based extension strategies and programs designed to enhance conservation efforts and sustainable livestock management.

INTRODUCTION

Due to population growth and the increasing demand for milk and dairy products, livestock production systems in developing countries like India are rapidly evolving. This growing pressure on production systems worldwide necessitates alternative strategies, such as crossbreeding, to enhance milk yield and ensure sustainability. Eventually, many indigenous breeds have been displaced by intensively selected breeds and their high-input input-high output production systems. However, many indigenous breeds

have survived, especially in areas where high-input, high-output systems were not established for economic, cultural, or environmental reasons (Sreelakshmi & George, 2019). Indigenous cattle are renowned for their amazing capacity for endurance under hot tropical climates, resilience to tropical diseases and low maintenance cost. The various indigenous breeds of agricultural animals are mostly the consequence of evolutionary processes (Rai et al., 2023). The total indigenous cattle population of India has declined by 6 per cent in 2019, when compared to the previous census of 2012. However, the pace of this decline is much lesser

compared to previous census (2007-12) which was about 9 per cent (20th Livestock census, 2019). Crossbreeding in India has primarily aimed at improving milk production, disregarding the genetic potential of indigenous breeds, while demographic pressures have led to a decline in native cattle populations due to the growing demand for animal protein through milk production (Sarang et al., 2024).

Conserving the genetic diversity of indigenous cattle breeds is of utmost importance, given their varying conservation status. The loss of cattle genetic diversity has been found to be augmented by intensification of production systems, lack of characterization of indigenous breeds adapted to a particular agro-ecological zone, and also inappropriate breed replacement by crossbreeding with high producing breeds to improve productivity (Mukesh & Sodhi, 2013). To meet the need of future generations, concerted efforts are needed to conserve and grow indigenous cattle. In recent years, indigenous cattle breeds have gained scientific and policy attention for their adaptability, genetic diversity and contributions to sustainable livestock production, while also playing a significant role in maintaining biodiversity, supporting ecosystem services, preserving cultural and socio-economic values in traditional farming systems. Attitude towards conservation is more easily defined theoretically than observed in reality because it includes a wide variety of dimensions (Winter et al., 2005). The attitude behaviour relationship in the context of farmers' conservation behaviour and attitudes was found to be a prime predictor of farmer conservation behaviour (Padel, 2001). Considering the aforementioned factors, the present study was conducted with the aim of developing and validating a standardized scale to measure farmers' attitudes toward the conservation of indigenous cattle.

METHODOLOGY

Attitudes toward conserving specific cattle breeds or vegetation comprise multiple dimensions. These attitudes can be measured directly by asking respondents to report their beliefs or evaluations, or indirectly by studying responses believed to correlate with attitudes (Bohner & Wanke, 2002). The study was conducted in the Bareilly district of Uttar Pradesh state of India. In the current study, attitude was defined as the positive or negative predisposition of farmers towards indigenous cattle rearing, serving as a significant factor influencing their behaviour in conserving these cattle. A scale to assess respondents' attitudes towards indigenous cattle rearing was developed using Likert's summated rating method (Likert, 1932). A total of 70 statements were tentatively selected, comprising 45 positive and 25 negative statements, ensuring their relevance to the study area. The collected statements were carefully refined according to the 14 informal criteria suggested by Edwards (1957). As a result, 55 statements were retained out of the initial 70.- After that, the test of relevancy was carried out on the remaining 55 selected statements, in which the statements were sent to 42 experts for their expert evaluation of the statements' relevancy (Boora et al., 2024; Panigarhi et al., 2024; Vavilala et al., 2024). The responses to the statements were collected through personal interviews, email, and a Google form. The experts were scientists/professors from ICAR institutions and veterinary and agricultural universities. The responses were collected on a three-point

continuum, viz., Most Relevant, Relevant, and least Relevant, with scores 3, 2, and 1, respectively. A total of 36 statements were selected as relevant based on the rating of 30 judges who responded, and these items were used further for the critical ratio or t-value estimation. Finally, statements with a t value of 1.75 or higher were finally selected for the scale. The split-half method assessed the reliability of this scale, while the content validity test evaluated validity.

RESULTS

The data presented in Table 1 comprises 36 selected items related to the conservation of indigenous cattle within the specific context. The selection of relevant statements for the scale was conducted after the relevancy test.

Relevancy test

The relevancy judgements along with valuable suggestions were received from 30 judges in stipulated time of one month. In order to ensure the field applicability of the statements, relevancy scores were also obtained from 20 field veterinarians in Bareilly district. The responses obtained from both the group of judges to each statement were combined together. The Relevancy Weightage (RW) and Mean Relevancy Score (MRS) for each selected indicator were calculated individually using the following formula:

$$\text{Relevancy Weightage (RW)} = \frac{(\text{Most relevant} \times 3) + (\text{Relevant} \times 2) + (\text{Least relevant} \times 1)}{\text{Maximum possible score}}$$

$$\text{Mean Relevancy Score (MRS)} = \frac{(\text{Most relevant} \times 3) + (\text{Relevant} \times 2) + (\text{Least relevant} \times 1)}{\text{Number of judges}}$$

$$\text{Overall Mean Relevancy Score (OMRS)} = \frac{\text{Sum of weightage of all indicators}}{\text{Total Number of judges} \times \text{Total Number of statements}}$$

Item analysis

Item analysis is an essential process in developing a valid and reliable scale using Likert's rating technique of measurement. It is conducted to identify items that contribute to an internally consistent scale while eliminating those that do not (Spector, 1992). All statements having Relevancy Weightage (RW) value of more than 0.75 and Mean Relevancy Score (MRS) value of more than or equal to Overall Mean Relevancy Score (OMRS) i.e., 2.24 were considered for item analysis. As a result a total of 36 statements were selected for evaluation of critical ratio ('t'- value). All the 36 statements which were selected after expert relevancy test were administered to a random sample of 48 cattle farmers who reared indigenous cattle in the non-sample area of Bishnupur district of Manipur state. These cattle farmers were requested to express their degree of favourableness or unfavourableness towards each statement on five point continuum from 'strongly agree', 'agree', 'undecided', 'disagree' and 'strongly disagree' with score of 5, 4, 3, 2 and 1 respectively for positive statements and the scoring pattern was reverse for negative statements. The overall score for each respondent was determined by summing up the scores across all items. Based on total individual scores, the respondents were systematically arranged in descending order. For determining the 't' value, 25 per cent of the respondents with highest scores and 25 per cent with lowest scores i.e., 12 respondents each from these two groups were taken for item analysis. Item analysis was

Table 1. Relevancy Weightage (RW), Mean Relevancy Score (MRS), t-value of the attitude statements, selected statements with their respective "I-CVI"

S. No.	Attitude Statements	RW	MRS	t-value	Agree-ment	I-CVI
1	Since native cattle are climatically adapted, they do not require particular care (-)	0.76	2.29	2.42*	5	1
2	I believe that the native cattle are worth keeping since they have good temperament (+)	0.85	2.55	4.13*	4	0.80
3	Native cattle are mainly utilized for draught purposes	0.75	2.26	1.53	-	-
4	I prefer to keep native cattle since they have better disease resistance than exotic cattle (+)	0.79	2.38	2.43*	5	1
5	The daily income generated from indigenous cattle farming is comparatively lower than that from crossbred cattle farming (-)	0.75	2.26	2.43*	5	1
6	I feel that local people should engage in a more active role, only then conservation of native cattle will be successful	0.85	2.55	1.25	-	-
7	Native cattle have better milk quality, value and taste than exotic cattle	0.90	2.71	1.18	-	-
8	Only socio-economically weaker sections of the society rear the indigenous cattle (-)	0.81	2.43	5.11*	4	0.80
9	It is necessary to establish breeding facilities exclusively for native cattle	0.86	2.57	1.62	-	-
10	Native cattle are traditionally reared from past generation considering their cultural and aesthetic value (+)	0.80	2.40	2.65*	5	1
11	The younger generation shows a lack of interest in managing and rearing indigenous cattle (-)	0.80	2.40	2.40*	5	1
12	Indigenous cattle exhibit efficient grazing behaviour throughout all seasons	0.77	2.31	1.27	-	-
13	Indigenous cattle have superior resilience and survivability compared to crossbred cattle during natural disasters (+)	0.77	2.31	1.95*	5	1
14	There is a need to review respective state breeding policies so as to prioritize their conservation efforts	0.91	2.74	1.67	-	-
15	I am skeptical about the potential benefits associated with native cattle farming	0.81	2.43	1.21	-	-
16	The farmyard manure produced by indigenous cattle is more beneficial for agricultural purposes	0.83	2.48	1.18	-	-
17	Indigenous cattle can thrive well in basic or traditional (kaccha) housing structures (+)	0.80	2.40	4.83*	4	0.80
18	The slaughter of indigenous cattle (cows and bulls) for meat should be actively discouraged (+)	0.83	2.50	1.95*	5	1
19	In my opinion, native cattle require relatively minimum maintenance and care	0.75	2.26	1.21	-	-
20	I do not want to keep native cattle as they produce less milk output (-)	0.79	2.36	2.72*	5	1
21	Keeping native cattle will not be beneficial in the long run (-)	0.82	2.45	2.22*	5	1
22	I keep native cattle because they are less expensive to buy than crossbred cattle (+)	0.87	2.62	3.45*	5	1
23	There should be collaboration between government and research institutions in order to effectively maintain local cattle population	0.90	2.71	1.54	-	-
24	Provision of Artificial Insemination exclusively for native cattle should be established	0.87	2.60	0.98	-	-
25	The excreta (dung, urine) of native cattle have lot of medicinal properties than crossbred or exotic cattle (+)	0.80	2.40	1.95*	4	0.80
26	I think banks will not support in providing loans to keep native cattle (-)	0.83	2.50	2.75*	4	0.80
27	Running native cattle farm are not as profitable as crossbreed or exotic cattle farms (-)	0.89	2.67	3.20*	4	0.80
28	I believe it's not possible to bring rearing of native cattle up to the commercial business level	0.76	2.29	1.67	-	-
29	Native cattle are an indispensable part of our culture and should be conserved	0.80	2.40	1.27	-	-
30	Preference for using milk from native cattle over that from crossbreed or exotic cattle for religious purposes	0.82	2.45	1.25	-	-
31	Indigenous cattle demonstrate a higher efficiency in utilizing agricultural by-products as feed resources	0.79	2.38	1.35	-	-
32	The overall lifetime productivity of indigenous cattle is lower compared to that of crossbred cattle (-)	0.76	2.29	3.24*	5	1
33	The native cattle's dung can be used for fuel, manure and building materials (+)	0.79	2.38	2.57*	5	1
34	The selection of a superior breeding bull is necessary for maintaining pure germplasm in order to conserve native cattle (+)	0.88	2.64	2.65*	5	1
35	I prefer to expand my farming operations by increasing the population of native cattle on my farm	0.79	2.36	1.16	-	-
36	The market demand and commercial viability of indigenous cattle are relatively limited (-)	0.87	2.62	2.68*	4	0.80
OMRS		2.24	S-CVI/Avg 0.93			
		Total agreement 13				

*Selected Statements, (+): Positive Statements, (-): Negative Statements, I-CVI= Item Level Content Validity Index, S-CVI= Scale-Content Validity Index

conducted based on the criteria established by these two groups. The 't' value, is a measure of how effectively a statement differentiates between high and low respondent groups for each item and was calculated using the formula provided by Edwards (1957).

$$t = \frac{\bar{X}_H - \bar{X}_L}{\sqrt{\frac{\Sigma(X_H - \bar{X}_H)^2 + \Sigma(X_L - \bar{X}_L)^2}{n(n-1)}}$$

Where,

$$\Sigma(X_H - \bar{X}_H)^2 = \Sigma(X_H)^2 - \frac{(\Sigma X_H)^2}{n} \text{ and } \Sigma(X_L - \bar{X}_L)^2 = \Sigma(X_L)^2 - \frac{(\Sigma X_L)^2}{n}$$

$\bar{X}_H$ = Mean score of a given statement in high group

$\bar{X}_L$ = Mean score of a given statement in low group

$\Sigma(X_H)^2$ = Sum of squares of the individual score on a given statement for high group

$\Sigma(X_L)^2$ = Sum of squares of the individual score on a given statement for low group

ΣX_H = Summation of scores on given statement for high group

ΣX_L = Summation of scores on given statement for low group

n = Number of respondents in each criterion group

The critical ratio ('t'- value) of each statement was calculated for the remaining items and those items having t value equal to or, more than 1.75 were selected as this t-value significantly differentiated between high and low groups of items and those having t value <1.75 were discarded as per the rule suggested by Bird (1940). Based on the prescribed selection criteria, 20 statements were retained for the final scale, as they exhibited the highest discriminatory power, while items with low discrimination indices and lower validity were excluded. Consequently, the finalized attitude scale comprised 20 items, consisting of positive (10) and negative (10) statements for measuring the attitude towards the conservation of indigenous cattle. Both positive and negative statements were included in the final scale deliberately avoiding neutral statements, following the methodological recommendations of Edwards & Kilpatrick (1946).

Reliability of the scale

The reliability of a testing instrument refers to its capacity to yield consistent, stable, and precise measurement scores upon repeated administration using the same instrument. It helps in evaluating the homogeneity of items within the scale. In the present study, the split-half method was employed to assess the reliability of the scale by dividing the items into two subsets based on odd and even-numbered statements. The Pearson product-moment correlation coefficient between the scores of the two halves was calculated as 0.654, representing the split-half reliability of the scale. To adjust this coefficient for full-test reliability, the Spearman-Brown prophecy formula (1910) was applied as follows:

$$R = \frac{2r}{1+r} = \frac{2 \times 0.654}{1+0.654} = 0.791$$

Where, R= Reliability coefficient of the whole scale

r = Pearson correlation between two halves

In the present study, standardized Cronbach's alpha was also employed to enhance the stability and accuracy of reliability

estimation, as calculated using the following formula:

$$\alpha_{standardized} = \left(\frac{K}{K-1} \right) \left(\frac{S_y^2 - \Sigma S_i^2}{S_y^2} \right) = \frac{20}{20-1} \left[\frac{103.92 - 21.82}{103.92} \right] = 0.829$$

Where, K is the number of items in scale,

S_y^2 = Variance associated with total observed score,

S_i^2 = Variance associated with individual item score.

The value of Cronbach's alpha is found to be 0.829.

Validity of the scale

The validity of the scale was established through content validity. As defined by Kerlinger (1987), content validity refers to the representativeness or sampling adequacy of the content, substance, subject matter, and topics covered by a measurement instrument. Various methods exist to quantify experts' agreement on content relevance, with this study adopting Lynn's (1986) widely accepted approach. To quantify content validity, the 20 selected statements ('t' value >1.75) were evaluated by six experts (professors). The number of experts was limited to six, as increasing the panel size reduces the likelihood of complete agreement. A four-point rating scale was employed, following Davis (1992), to eliminate a neutral or ambivalent midpoint: 1 = not relevant, 2 = somewhat relevant, 3 = quite relevant and 4 = highly relevant. The Content Validity Index for individual items (I-CVI) was calculated to assess their relevance to the underlying construct, and subsequently, the Scale Content Validity Index (S-CVI) was computed to determine the overall content validity of the scale and is calculated by taking the sum of the I-CVIs divided by the total number of items. S-CVI/Ave > 0.9 has excellent content validity. For the current test, the calculated value of S-CVI/Avg of all the test items was 0.930.

DISCUSSION

A methodological approach in developing an attitude scale of farmers towards the conservation of indigenous scale indicates the systematic procedures and techniques used to design, develop, and analyse to ensure the scale's reliability and validity. The current study discussed the collection of attitude statements or items related to various aspects of indigenous cattle rearing, including socio-cultural roles, feeding, breeding, housing, healthcare, management, religious significance, draught utility, milk quality, and conservation. Editing of the statements by following Edwards' criteria to finalize the items for its relevancy test is performed. A total of 55 items for the relevancy test and 36 items were selected by calculating the mean relevancy score (≥ 2.24) and further for item analysis in the non-sampling area of our study. Computation of the critical value or t-value of each statement for the final selection of items having 20 items consisting of 10 positive and 10 negative items. Standardisation of the scale: The present scale was standardized by establishing its reliability and validity. Reliability was determined using the split-half method and Cronbach's alpha, while validity was ensured through content validity assessment. The overall test reliability was determined to be 0.791, and since the reliability coefficient exceeded 0.7, the scale was considered highly reliable. Similar findings were reported by Kavithaa et al., (2021) in their

development of a scale to measure farmers' attitudes towards Kangayam cattle rearing in southern Tamil Nadu. Their study obtained a reliability coefficient of 0.823, indicating high internal consistency and testifying to the scale's reliability. The Cronbach's alpha value was found to be 0.829, indicating that the standardized attitude scale exhibits good internal consistency. This finding aligns with Shitu et al., (2018); Gupta et al., (2022) Boora et al., (2024), who reported a similar Cronbach's alpha for standardized attitude scale, thereby confirming the reliability of such scales. With an overall content validity of the test items coming at 0.930, the attitude scale constructed is considered highly stable and valid. This finding is in line with the results of Verma et al., (2024), who conducted a content validation process to measure sheep farmers' attitudes toward scientific sheep husbandry. Their study reported a content validity index of 0.908 for the overall scale. Administration of the developed scale can be done using a five-point continuum—strongly agree, agree, undecided, disagree, and strongly disagree—scored as 5, 4, 3, 2, and 1, respectively, for positive statements and reverse scoring applied to negative statements. The attitude of farmers towards the conservation of indigenous cattle can be evaluated using the class interval method by determining the range, minimum, and maximum scores. The total attitude score of a respondent is obtained by summing the individual statement scores based on their responses.

CONCLUSION

The newly developed standardised scale exhibits strong reliability and validity with a rigorous methodological process, from comprehensive item generation to systematic item analysis. It effectively measures various aspects of indigenous cattle rearing, demonstrating clear scoring procedures and adaptability for use by researchers, extension personnel, and policymakers seeking to evaluate or enhance farmer engagement in indigenous cattle conservation. While limited by its regional focus and the need for larger, more diverse samples, the scale provides a valuable evidence-based framework for designing targeted conservation programs and guiding sustainable livestock management. Future refinements could incorporate wider cultural contexts and longitudinal assessments to capture evolving attitudes over time.

REFERENCES

- 20th Livestock Census (2019). Government of India, Ministry of Agriculture Department of Animal Husbandry, Dairying and Fisheries, Krishi Bhawan, New Delhi.
- Bird, C. (1940). *Social psychology*. New York: Appleton Century Crofts.
- Bohner, G., & Wanke, M. (2002). *Attitudes and attitude change*. Psychology Press, East Sussex, 295.
- Boora, S., Chander, S., & Kaur, B. (2024). Attitude scale for assessing farmers' attitude toward drip irrigation. *Indian Journal of Extension Education*, 60(4), 123-126.
- Davis, L. L. (1992). Instrument review: Getting the most from your panel of experts. *Applied Nursing Research*, 5, 194-197.
- DeVellis, R. F. (2012). *Scale development: Theory and applications*. Los Angeles: Sage, pp 109-110.
- Edward, A. L. (1957). *Techniques of Attitude Scale Construction*. Vakils, Feffer and Simons Inc, New York.
- Edwards, A. L., & Kilpatrick, F. P. (1946). A technique for the construction of attitude scales. *Journal of Applied Psychology*, 32, 374-384.
- Gupta, S. K., Nain, M. S., Singh, R., & Mishra, J. R. (2022). Development of scale to measure agripreneurs attitude towards entrepreneurial climate. *Indian Journal of Extension Education*, 58(2), 153-57. <http://doi.org/10.48165/IJEE.2022.58237>
- Kavithaa, N. V., Manivannan, C., Rajkumar, N. V., Kumarasamy, P., & Manokaran, S. (2021). Development of a scale to measure the attitude of farmers towards Kangayam cattle rearing. *Biological Forum- An International Journal*, 13(3), 812-816.
- Kerlinger, F. N. (1987). *Foundations of Behavioural Research*. 3rd edition. Holt, Rinehart and Winston.
- Likert, R. A. (1932). A technique for the measurement of attitude. *Archives of Psychology*, 140.
- Lynn, M. R. (1986). Determination and quantification of content validity. *Nursing Research*, 35, 382-385.
- Mukesh, M., & Sodhi, M., (2013). Genetic uniqueness of Indian native cattle with special reference to their A1/A2 allelic status, in: R.K. Pundir, S.K. Niranjana, R. Behl (Eds.), *Sustainable Utilization of Indigenous Animal Genetic Resources of India*, National Bureau of Animal Genetic Resources, Karnal, Haryana, India, 208.
- Padel, S. (2001). Conversion to organic farming: a typical example of the diffusion of an innovation? *Sociologia Ruralis*, 41, 40-61.
- Panigarhi, S. P., Ghadei, K. G., Nikhil, J., Chennamadhava, M., Sethi, K., & Gupta, R. P. (2024). Construction and standardisation of agripreneurial performance scale. *Indian Journal of Extension Education*, 60(3), 88-92.
- Rai, A., Gangwar, C., Upadhyay, P.K. & Mishra, S. (2023). Indigenous cattle (A2 Cattle) conservation and development-a crucial socioeconomic component: A review. *Asian Journal of Dairy and Food Research*, 1-6.
- Sarang, S. K., Sreekumar, D., & Sejian, V. (2024). Indigenous cattle biodiversity in India: Adaptation and conservation. *Reproduction and Breeding*, 4(4), 254-266.
- Shitu, G. A., Nain, M. S., & Kobba, F. (2018). Development of scale for assessing farmers' attitude towards precision conservation agricultural practices. *Indian Journal of Agricultural Sciences*, 88(3), 499-504.
- Spector, P. E. (1992). Summated Rating Scale Construction: An Introduction Sage University, Papers Series. *Quantitative Applications in the Social Sciences*, 7-82.
- Sreelakshmi, C. M., & George, P. R. (2019). Development of a scale to measure the attitude of cattle keepers towards the conservation of native cattle. *Journal of Veterinary and Animal Science*, 50(1), 11-16.
- Vavilala, P., Singh, V. K., Singh, D. K., & Singh, L. B. (2024). Attitude of the staff towards farmer producers organization—development and standardization of the scale. *Indian Journal of Extension Education*, 60(1), 116-119.
- Verma, H., Singh, M., Chander, M., Meena, H. R., Saran, V., & Prabex, S. (2024). Development and validation of a scale to measure the attitude of sheep farmers towards scientific sheep husbandry. *Journal of Community Mobilization and Sustainable Development*, 19(4), 915-920.
- Winter, J. S., Esler, J. K., & Kidd, M. (2005). An index to measure the conservation attitudes of land owners towards Overberg Coastal Renosterveld, a critically endangered vegetation type in Cape Floral Kingdom. South Africa. *Biological Conservation*, 126(3), 383-394.