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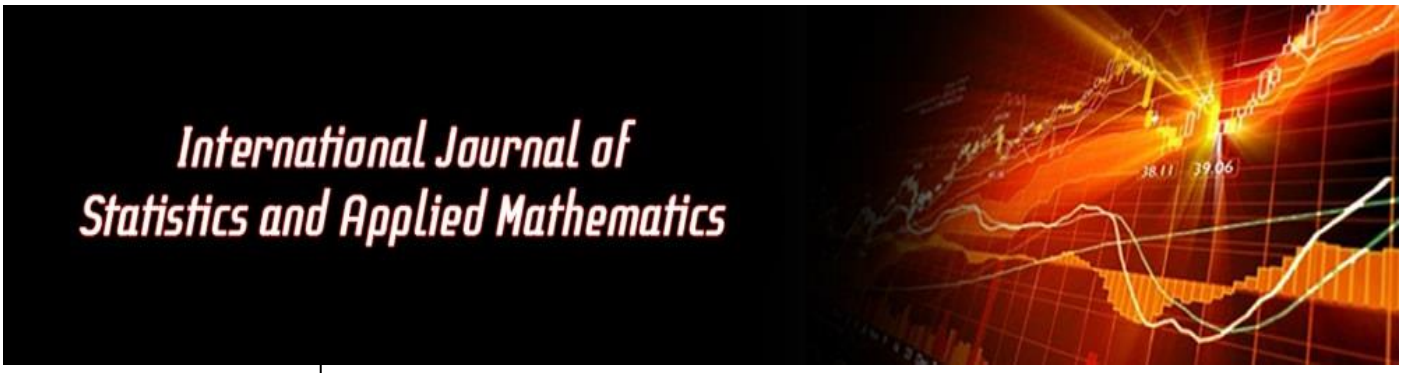

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A scale measuring attitude of goat farmers towards adoption of Artificial Insemination (AI)

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Abstract
Based on "Scale Product Method, a scale was developed to measure the attitude of the goat farmers towards adoption of artificial insemination (AI) in goat breeding system. Considering the relevance of statements appropriate for the field of research, a preliminary list of 28 statements was compiled. Edited statements were based on suggested criteria. Summarising the weights of each scale component yielded its score. By using Thurstone and Chave's inter-quartile range, scale and Q value were computed. Finally the scale consisted of 14 statements whose median (scale) values were greater than Q values and median value greater than 5.5. The reliability coefficient for the entire scale, based on 20 respondents, was 0.83.

Keywords: Adoption, artificial insemination, attitude, goat farmers and scale product method

Introduction
The Artificial insemination provides the opportunity to widely utilise the superior male in a wide range of contexts. The technique is broadly employed with cattle and is also effective with goats, sheep, pig and poultry (Khadse *et al*., 2019) [9]. Artificial insemination in sheep and goat was initially published in 1987. So far, in comparison to other livestock, goats undergo comparatively few artificial inseminations each year i.e. only 0.5 million globally (Dhara *et al*., 2023) [2]. In India, most goat husbandry is extensive and semi-intensive, and breeding follows unrestrained natural mating (Dutta Baruah *et al*., 2023) [3]. Finding suitable bucks for breeding is a challenge for goat farmers (Tajonar *et al*., 2022) [15]. Better breeding management requires enough high-quality stud bucks. Due to breeding buck shortages, almost 30% of oestrus remain unserved (Karim *et al*., 2019) [8]. To overcome this trend of negative selection, preservation of pure and superior germplasm, cryopreservation of high-quality goat semen and artificial insemination (AI) is the need of the hour (Ranjan *et al*., 2022) [13]. Despite the government's considerable efforts to promote AI use nationwide, adoption rates vary widely across and within agro-ecologies due to socioeconomic and institutional challenges. In any process of technology diffusion in a social unit, a number of farmers adopt a technology only partially, while others abandon it entirely after implementing it. Hence, the pattern of adoption of AI in goat at field level needs to be evaluated. Furthermore, the availability of empirical data regarding the key determinants that impact on farmers' attitudes towards adoption and other relevant aspects was inadequate. With this objective in mind, this study was conducted to create a reliable measurement tool for assessing the attitude of goat farmers towards the adoption of artificial insemination (AI), in order to accurately reflect the current state of goat breeding practices.

Methodology
The "Scale Product Method" was used to develop the attitude scale, using Thurston's Equal Appearing Interval Scale (1928) for item selection and Likert's summated rating (1932) [10] for scale response, as proposed by Eysenck and Crown (1949) [6].

Collection of statements: In the initial phase of scale development, a total of 32 statements were tentatively listed from relevant literature, vets, researchers, extension workers and

veterinary department officials who had been directly or indirectly exposed to such knowledge system. The collected statements were revised using the standards set by Thurstone and Chave (1928) [16], Likert (1932) [10], Edward and Kilpatrick (1948) [5], and Edward (1957) [4]. Out of the reviews, 28 statements were picked for the judgement (table 1). A group of 20 judges was chosen to rate each statement on a 7-point scale from "Irrelevancy" to "Relevancy" comprising- strongly irrelevant (1), irrelevant (2), somewhat irrelevant (3), neutral (4), somewhat relevant (5), relevant (6) and strongly relevant (7).

Table 1: Twenty-eight Statements selected for judgment

Sl. No.	Statements
1	Adopting AI in goat is a wise approach to get better income.
2	There is no risk in adopting AI technology in goat breeding system.
3	AI technology is a potential tool for dealing with breeding problem.
4	AI adoption in goat is only in accordance with the needs of the goat farmers.
5	AI is the most important technology to upgrade indigenous goat.
6	AI progenies of goat are more productive.
7	Goat AI does not yield the same amount of return as large ruminant AI.
8	AI reduces the purchasing and maintaining cost of bucks.
9	If AI prices hike, I may stop breeding goats with AI.
10	If AI progeny could be sold for a premium, I might adopt AI in a continuation.
11	AI is not so compatible with our indigenous goat breeds.
12	AI offspring are barely susceptible to diseases.
13	I feel adoption of AI technology results in modernization.
14	Only educated and resourceful farmers can adopt AI.
15	AI will help in preventing transmission of many goat diseases.
16	I feel that scopes of adopting AI in indigenous goat are limited.
17	Adopting AI will enhance my reputation as a goat farmer
18	AI technology could only be used on commercialised goat farms.
19	My recommendation is to breed goats with AI.
20	I see AI in goat as an added burden.
21	I feel that AI technology requires less input.
22	I found good conception rate in goat by AI
23	AI in livestock does not hold prestige in the society.
24	AI technology is complex than the traditional mating method.
25	Estrous detection is very difficult leading to untimely AI
26	Lack of efficient AI inseminators and close servicing facilities hinders adoption.
27	Time constraints make AI adoption difficult.
28	Artificial insemination solved the good-quality buck shortage in the village

Calculating the Scale (Median) and Quartile value

After receiving the responses from the judges, the Scale value (S) and inter quartile range value (Q) for each statement were calculated. Median was used as the scale value to show the relevancy or irrelevancy, and quartile deviation as the Q-value, as a measure of variance for a given statement. Scale value was calculated with the help of

$$S = L + \frac{0.50 - \Sigma Pb}{Pw} \times i$$

Where,

S = Median or Scale value of statement

L = Lower limit of the interval in which the 50th centile falls

ΣPb = Sum of the proportion below the interval in which the 50th centile falls

P = Proportion within the interval in which the 50th centile falls

I = Width of the interval, which was assumed as equal to 1.0

The inter-quartile range Q was employed by Thurstone and Chave (1928) [16] to measure the variation in the judgments' distribution for a particular statement (Edwards, 1957) [4]. So, to determine the Q value, two other point were measured; the 75th centile (C_{75}) and 25th centile (C_{25}). Then, the interquartile range or Q value was obtained by taking the difference between C_{75} and C_{25} thus, $Q = C_{75} - C_{25}$.

Only those statements were selected whose S values were greater than Q value and S values greater than 5.5 (table 2). When a few statements had the same scale values, the statements having lowest Q values were selected (Thurstone, 1946) [17].

Table 2: Selected statements for the scale (based on descending order of Scale value and ascending order of Quartile value)

Statements no	6*	1*	14*	3*	20*	12*	8*	26*	5*	28*	19*	22*	11*	15*
S value	7	7	7	7	7	7	6	6	6	6	6	6	5.5	5.5
Q value	0	0.5	1	1	1	1.5	0	1.5	1.5	1.5	1	1	1	1
Statements no	24	7	18	21	2	25	16	17	27	10	23	9	4	13
S value	5	5	5	5	5	5	4.5	4	4	4	4	4	3.5	3
Q value	1	1	1	1	1	1	1.5	1.5	1.5	1.5	1.5	2	1	2

*Selected (S value >Q value, S value >5.5)

Thus, based on the S and Q values, 14 statements were finally selected to constitute the attitude scale (table 3). In a similar pattern, Patel and Chauhan (2010) [12] created and standardised a scale to quantify their research objectives.

Table 3: Final statements of the scale

Sl. No.	Final statements
1	AI progenies of goat are more productive. (+)
2	Adopting AI in goat is a wise approach to get better income. (+)
3	Only educated and resourceful farmers can adopt AI. (-)
4	AI technology is a potential tool for dealing with breeding problem. +)
5	I see AI in goat as an added burden. (-)
6	AI offspring are barely susceptible to diseases. (+)
7	AI reduces the purchasing and maintaining cost of bucks. (+)
8	Lack of efficient AI inseminators & close servicing facilities hinders adoption. (-)
9	AI is the most important technology to upgrade indigenous goat. (+)
10	AI solved the good-quality buck shortage in the village. (+)
11	My recommendation is to breed goats with AI. (+)
12	I found good conception rate in goat by AI. (+)
13	AI is not so compatible with our indigenous goat breeds. (-)
14	AI will help in preventing transmission of many goat diseases. (+)

Reliability of the scale

A scale is reliable when it consistently produces the same result when applied to the same sample (Gulkari and Chauhan, 2014) [7]. In the present study, the Spearman-Brown (1910) [14] split-half method of reliability was used. The fourteen statements were divided into two halves with seven odd numbered in one half and other seven even numbered statements in the other. These statements were administered to 20 goat farmers (respondents) in a non-sample area (i.e. Khanapara, Kamrup metro, Assam). Furthermore, the respondents were requested to indicate the degree to which they agreed or disagreed with each statement using a five-point scale (Likert, 1932) [10] continuum containing "Strongly agree, Agree, Undecided, Disagree, and strongly disagree." The scoring pattern for positive statements was 5, 4, 3, 2, 1, and the scoring pattern for negative statements was 1, 2, 3, 4, and 5 respectively. The attitude score of a respondent was obtained by summing up the scores of all items. Thus, total score obtained by each respondent was calculated ranging from 20 to 100. Each of the two sets of statements was treated as a separate scale.

Table 3: Reliability test of scale using split-half method

Sl. No.	Even statement	Odd Statement	X_O	X_E	X	Y	X^2	Y^2	XY
1	6	1	96	90	11.14	7.86	124.16	61.73	87.55
2	14	3	93	92	8.14	9.86	66.31	97.16	80.27
3	20	12	94	84	9.14	1.86	83.59	3.45	16.98
4	8	26	83	85	-1.86	2.86	3.449	8.16	-5.31
5	5	28	83	79	-1.86	-3.14	3.449	9.88	5.83
6	19	22	75	75	-9.86	-7.14	97.16	51.02	70.41
7	11	15	70	70	-14.86	-12.1	220.73	147.45	180.41
Total score			594	575			598.85	378.85	436.14

Each of the two sub-scales were correlated (Pearson product-moment correlation coefficient) by using the following formula:

$r^{1\backslash 2} = \sum XY / \sqrt{X^2+Y^2}$
$= 436/618.31 = 0.71$

Where,
X_O= Total score of each odd statement
X_E = Total score of each even statement
$X_T = \sum X/7 = 84.86$
$Y_T = \sum Y/7 = 82.14$
$X = (X_O - X_T)$
$Y = (X_E - Y_T)$

The 'r½' value obtained was 0.71. Since this really measures the reliability of only half of the test, an adjustment was made to obtain the true reliability using the Spearman-Brown (1910) [14] prophecy formula:

r = 2r ½ / 1+r ½ i.e. Reliability coefficient of the whole test = 2 x (reliability of the half test) /1+ (reliability of the half test)
r=2x0.71/1+0.71=1.42/1.71=0.83

The obtained 'r' value was found to be 0.83 which indicated a high reliability of the scale. Similar reliability coefficients were also obtained by Patel and Patel (2005) [11] and Vaidya and Chauhan (2012) [18] in their scales preparation for the evaluation of farmers' attitudes.

Validity of the scale

Content validity of the attitude scale was examined. With the assistance of experts (major guide and advisory members), statements were chosen to encompass the entirety of the subject matter. The experts determined that the content of the scale was relevant to measure the goat farmers' attitude towards adopting artificial insemination in goat breeding system. Therefore, the existing scale met the criteria for the content validity. Based on Likert's summated rating scale method, an analogous scale was also developed by Dutta Baruah *et al*. (2023) [3] to evaluate the attitude of farmers towards implementing AI in goat in Assam.

Conclusion

It is very much necessary to understand and analyse the farmers' attitude towards adopting any new scientific technology in livestock husbandry. Efforts need to be made to

develop positive attitude. At this juncture, this scale was developed to study the attitude of goat rearers towards adopting AI in goat breeding. The final scale consisted of 14 statements (10 positives and 4 negatives) which was found to be reliable and had validity.

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