P-ISSN: 2618-0723
E-ISSN: 2618-0731

NAAS Rating: 5.04
www.extensionjournal.com

International Journal of Agriculture Extension and Social Development

Volume 7; Issue 2; Feb 2024; Page No. 172-177

Received: 24-11-2023
Accepted: 29-12-2023

Indexed Journal
Peer Reviewed Journal

Construction of attitude scale for agricultural scientists towards their profession: A methodological approach

[1]Aaysha Kamar and [2]S Helen

[1]Ph.D Scholar, Department of Agricultural Extension, College of Agriculture, Vellanikkara, Kerala Agricultural University, Thrissur, Kerala, India

[2]Professor and Head, Central Training Institute, Kerala Agricultural University, Mannuthy, Thrissur, Kerala, India

DOI: https://doi.org/10.33545/26180723.2024.v7.i2c.322

Corresponding Author: Aaysha Kamar

Abstract
The research follows a systematic approach to develop and standardize items aimed at measuring the attitude of agricultural scientists towards their job. Initially, a total of 70 items were identified through an extensive literature review. Through collaboration with experts, a refined set of 60 items was selected after undergoing screening and editing processes. The scale value and quartile value of these items were determined based on assessments from a panel of 60 experts. Fifty-four items were ultimately selected for standardizing the scale. To ensure the validity of the items, both content validity and Kappa statistics were employed, leading to the final selection of 26 items for the attitude scale. The items were administered among 30 scientists who were not part of the sample group to verify reliability. The reliability of the test items was assessed using Cronbach's alpha, resulting in a high reliability value of 0.955 for the study. As a result, the standardized items for effectively measuring the attitude of agricultural scientists towards their job and workplace were found to be reliable and valid.

Keywords: Attitude, agricultural scientists, reliability, content validity

Introduction

An attitude is a disposition to react favorably or unfavorably to a class of objects (Sarnoff, 1960) [1]. The role of attitude is significant in shaping how we perceive and react to different circumstances. It mirrors our mindset, convictions, and emotions, shaping our approach to challenges and interactions with others. In essence, our attitude is a potent influence that can affect not only our personal encounters but also the dynamics of the environments we engage with.

The contribution of agricultural scientists is crucial in the promotion of sustainable farming methods and the assurance of food security. The manner in which they approach their academic or occupational environments has a substantial influence on advancements and creativity within the agricultural field. A constructive attitude entails a dedication to ongoing education, cooperation with colleagues, and the practical application of scientific principles to tackle field problems. Agricultural scientists who engage in their work with commitment and excitement play a key role in shaping robust and effective agricultural systems.

The attitude scale serves as a psychological measurement instrument utilized to evaluate an individual's perspectives on specific objects, topics, or ideas. It commonly consists of a set of statements or inquiries crafted to measure the degree of agreement or disagreement from the respondent. The replies are quantified, generating a numerical scale that represents the individual's stance on the subject in question. In research, attitude scales play a crucial role by aiding psychologists and social scientists in comprehending and quantifying the intricate nature of human attitudes. They furnish a systematic approach for gauging subjective opinions, facilitating statistical analysis and comparisons among diverse groups or populations.

Methodology

Selection of respondents

Sixty agricultural scientists specialized in agricultural extension from research, extension and academic centers of Kerala Agricultural University and Indian Council of Agricultural Research (ICAR) institutes were selected using simple random sampling technique for the study.

Data collection

The method used for attitude scale construction is Scale product method pioneered by (Eysenck and Crown, 1949) [2] suggested by Likert method with Thurston's equal appearing interval scale for item selection. This method stands as a statistical approach utilized in psychological studies for the examination of personality traits. The steps in developing items for attitude scale include item collection, item analysis, standardization of items and final selection of items for the test (Meenambigai *et al.*, 2023) [3].

Item collection

A thorough compilation of statements was created and gathered from literature, books, and conversations with experts, agricultural scientists, and researchers. The statements underwent a review and revision process,

applying the criteria for attitude statements as delineated by (Edwards, 1957) [4] and endorsed by (Thurstone and Chave, 1629) [5], (Wang, 1932) [6], (Likert, 1932) [7], (Bird, 1940) [8], and (Edwars and Kilpatrick, 1948) [9].

Item analysis

After undergoing a screening procedure utilizing a five-point response scale that encompassed choices such as "Most Relevant (MOR)," "More Relevant (MR)," "Relevant (R)," "Less Relevant (LR)," and "Not Relevant (NR)" assigning a score of 4,3,2,1 and 0 respectively. The items were presented to a group of evaluators who assessed the relevance of each item through methods such as postal communication, Google forms, and in-person visits. This approach aims to eliminate content that is deemed weak or irrelevant. Moreover, the evaluators were allowed to propose modifications, additions, or removals to the statements.

Determination of scale value and quartile value

Based on the rating the median value of the distribution and Q value for each statement were calculated. The median of the distribution for each statement was taken as scale value of the statement. The scale value was worked out with the help of formula (Thurstone and Chave, 1929) [10]:

$$S = l + \left(\frac{0.50 - \sum P_b}{P_w}\right) i$$

Where, S = median or scale value of the statement
l = the lower limit of the interval in which the median falls
$\sum P_b$ =the sum of the proportions 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 one
The inter quartile range or Q value for each statement was worked out by the formula:

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

C_{75} was the 75_{th} centile and calculated by the formula:

$$C_{75} = l + \left(\frac{0.75 - \sum P_b}{P_w}\right) i$$

Where, *l*=the lower limit of the interval in which the 75th centile falls
$\sum P_b$=the sum proportion below the interval in which the 75th centile falls
P_w =the proportion within the interval in which the 75th centile falls

C_{25} was the 25_{th} centile and estimated by the formula:

$$C_{25} = l + \left(\frac{0.25 - \sum P_b}{P_w}\right) i$$

Where,
l = the lower limit of the interval in which the 25th centile falls
$\sum P_b$ = the sum proportion below the interval in which the 25th centile falls
P_w = the proportion within the interval in which the 25th centile falls

A higher Q value indicated that a statement was unclear or posed challenges in terms of the ratings it garnered. As a result, statements with elevated Q values were typically contemplated for exclusion. When multiple statements shared the same scale value, priority was given to the one with the lower Q value, signifying greater reliability and less ambiguity.

Standardization of scale

The reliability and validity of a scale were essential considerations in scale construction, ensuring the consistency and precision of the instrument to accurately measure its intended concept.

Validity test for the scale

The I-CVI served as a valuable instrument for evaluating the content validity of individual items in a scale or assessment. To compute the Content Validity Index at the item level (I-CVI), the ratio of experts who deemed the items relevant to the total number of content experts was calculated. The I-CVI ranged from 0 to 1, and its interpretation, as outlined by (Abdollahpour *et al.*, 2010) [11], is as follows:

The average item-level CVI (S-CVI/Ave) was the result of dividing the sum of the individual item-level CVIs (I-CVIs) by the total number of items in order to determine the Content Validity Index at the scale level (S-CVI). In this case, an S-CVI/Ave of 0.9 or higher showed outstanding content validity for the scale, implying a strong expert consensus that the items on the scale were pertinent and suitable for assessing the intended construct. A high S-CVI/Ave score indicated that the scale's overall content validity was at a high level.

(Wynd *et al.*, 2003) [12] suggested using multi-rater kappa statistics in addition to the Content Validity Index (CVI) to estimate content validity in order to overcome this restriction. Because they account for chance agreements among raters and reveal levels of agreement that go above what would be predicted by random chance, kappa statistics, or K, are very useful.

Table 1: Criteria for evaluating content validity index values

I-CVI	Interpretation
<0.70	Item to be disposed
0.70 – 0.79	Item needs revision
>0.79	Item is appropriate

For the estimation of modified kappa value, each items probability of chance agreements was calculated by the formula:

$$P_C = \frac{N!}{A!\,(N-A)!}\ X\ 0.5^N$$

Where,
N = number of experts in a panel
A = number of panelists who agree that the item is relevant
Finally, kappa value was estimated by formula:

$$K = \frac{(ICVI - P_C)}{(1 - P_C)}$$

Where,
I-CVI = item level content validity index
P_C = probability of chance agreement

The table below shows the criteria for interpreting modified kappa value given by (Cicchetti and Sparrow, 1981) [13].

Table 2: Criteria for evaluating kappa values

Kappa statistics value	Interpretation
0.40 – 0.59	Fair
0.60 – 0.74	Good
>0.74	Excellent

Reliability of the scale

To ensure the statistical confirmation of reliability, the chosen elements underwent pilot testing involving 30 scientists not included in the actual sample. Each participant responded to statements using a five-point scale, ranging from "strongly agree" to "strongly disagree," with corresponding scores of 5, 4, 3, 2, and 1 for positive statements and reverse scores for negative ones. The reliability of each statement was assessed using Cronbach's alpha method by (Cronbach, 1651) [14], which gauges the internal consistency of the scale. The value ranges from 0 to 1. The Cronbach's alpha was calculated using the formula:

$$\alpha = \frac{N.\bar{C}}{\bar{v} + (N-1).\bar{C}}$$

Where,
N= number of items
$\bar{C}$ = average covariance between item pairs
$\bar{V}$ = average variance

The proposed scale containing statements were presented to the selected respondents.

Results and Discussion

A distinct set of 70 statements were formulated to assess the attitude of agricultural scientists towards their profession. The chosen statements were sent to 100 experts. Nonetheless, only 60 judges managed to submit their assessments within the designated time frame.

With the help of relevancy score for each statement, Scale value and quartile value was calculated. It was found that, six statements indicating higher Q value and had same scale value. Thus those 6 statements were excluded from the scale development. Thus remaining 54 statements were retained to the next screening procedure.

The 54 statements were then subjected to standardization procedure. The content validity test was done both at item level i.e., item level content validity index (I-CVI) and at scale level i.e., item-level CVI (S-CVI/Ave). The result of the validity test is shown in Table 4.

Table 3: Criteria for evaluating Cronbach's alpha values

Value of Cronbach's alpha	Internal consistency
<0.5	Unacceptable
0.5 - 0.6	Poor
0.6 - 0.7	Questionable
0.7 - 0.8	Acceptable
0.8 – 0.9	Good
≥0.9	Excellent

From the table 4., 23 statements having I-CVI value less than 0.70 were rejected, 5 statements having value between 0.70 and 0.79 were revised and 26 statements having value greater than 0.79 were found to be appropriate for the scale. Therefore, 31 statements were retained for the scale development. Since, the S-CVI/Ave score greater than 0.90, it indicates that the scale's overall content validity is high. To overcome the restrictions in content validity, multi-rater kappa statistics value was estimated. The result of Kappa value and its interpretation is given in Table 5.

Table 4: Content validity test of the developed items

Sl. No.	Items	Relevancy count	I-CVI	Interpretation	Sl. No.	Items	Relevancy count	I-CVI	Interpretation
1	S1	54	0.9	Appropriate	28	S30	36	0.6	Disposed
2	S2	54	0.9	Appropriate	29	S31	54	0.9	Appropriate
3	S3	12	0.2	Disposed	30	S32	41	0.68	Disposed
4	S4	36	0.6	Disposed	31	S33	48	0.8	Appropriate
5	S5	48	0.8	Appropriate	32	S34	40	0.67	Disposed
6	S6	48	0.8	Appropriate	33	S35	43	0.72	Modified
7	S7	36	0.6	Disposed	34	S36	39	0.65	Disposed
8	S8	36	0.6	Disposed	35	S37	54	0.9	Appropriate
9	S10	24	0.4	Disposed	36	S38	54	0.9	Appropriate
10	S11	30	0.5	Disposed	37	S39	36	0.6	Disposed
11	S12	48	0.8	Appropriate	38	S40	37	0.62	Disposed
12	S13	48	0.8	Appropriate	39	S41	48	0.8	Appropriate
13	S14	42	0.7	Modified	40	S43	40	0.67	Disposed
14	S15	54	0.9	Appropriate	41	S44	54	0.9	Appropriate
15	S16	54	0.9	Appropriate	42	S46	32	0.53	Disposed
16	S17	32	0.53	Disposed	43	S47	54	0.9	Appropriate
17	S18	48	0.8	Appropriate	44	S48	39	0.65	Disposed
18	S19	48	0.8	Appropriate	45	S49	46	0.77	Modified
19	S20	48	0.8	Appropriate	46	S50	37	0.62	Disposed
20	S21	54	0.9	Appropriate	47	S52	48	0.8	Appropriate
21	S22	42	0.7	Modified	48	S53	39	0.65	Disposed
22	S23	54	0.9	Appropriate	49	S54	47	0.78	Modified
23	S24	48	0.8	Appropriate	50	S55	41	0.68	Disposed
24	S25	36	0.6	Disposed	51	S56	48	0.8	Appropriate
25	S26	30	0.5	Disposed	52	S58	32	0.53	Disposed
26	S27	48	0.8	Appropriate	53	S59	37	0.62	Disposed
27	S28	48	0.8	Appropriate	54	S60	48	0.8	Appropriate
		S-CVI/Ave = 0.903							

*I-CVI - item level content validity index

The result from the Table 5. Shows that, those items with kappa value greater than 0.74 were excellent and those items with kappa value less than 0.74 were removed. Thus 26 items were retained in the scale construction.

For checking the reliability of the constructed scale, the 26 statements were subjected for a pilot testing in 30 non-sample respondents i.e., Agricultural scientists. The statements were presented to respondents using a five-point continuum: Strongly Agree (SA), Agree (A), Undecided (UD), Disagree (D), and Strongly Disagree (SD), assigned scores of 4, 3, 2, 1, and 0, respectively for positive statements, and 0, 1, 2, 3, and 4, respectively for negative statements. Cronbach's alpha method was used to test reliability of the constructed scale. Table 7. shows the results of reliability test conducted. The Cronbach's alpha value obtained for the scale was 0.955, which had higher internal consistency of the scale. Thus, the scale was confirmed as reliable.

Table 5: Kappa value of the developed items

Sl. No.	Items	PC	K value	Interpretation	Sl. No.	Items	PC	K value	Interpretation
1	S1	3.78E-06	0.9	Excellent	17	S27	0.000553	0.79	Excellent
2	S2	3.78E-06	0.9	Excellent	18	S28	0.000553	0.79	Excellent
3	S5	0.000553	0.79	Excellent	19	S31	3.78E-06	0.9	Excellent
4	S6	0.000553	0.79	Excellent	20	S33	0.000553	0.79	Excellent
5	S12	0.000553	0.79	Excellent	21	S35	1.15E-44	0.72	Disposed
6	S13	0.000553	0.79	Excellent	22	S37	3.78E-06	0.9	Excellent
7	S14	0.013325	0.69	Disposed	23	S38	3.78E-06	0.9	Excellent
8	S15	3.78E-06	0.9	Excellent	24	S41	0.000553	0.79	Excellent
9	S16	3.78E-06	0.9	Excellent	25	S44	3.78E-06	0.9	Excellent
10	S18	0.000553	0.79	Excellent	26	S47	3.78E-06	0.9	Excellent
11	S19	0.000553	0.79	Excellent	27	S49	1.15E-46	0.72	Disposed
12	S20	0.000553	0.79	Excellent	28	S52	0.000553	0.79	Excellent
13	S21	3.78E-06	0.9	Excellent	29	S54	1.53E-46	0.69	Disposed
14	S22	0.013325	0.69	Disposed	30	S56	0.000553	0.79	Excellent
15	S23	3.78E-06	0.9	Excellent	31	S60	0.000553	0.79	Excellent
16	S24	0.000553	0.79	Excellent					

*P_c - probability of chance agreement *K value – kappa value

Administration of the test and final scoring

To compute individual scores in the scale-product method the Likert scale value and the scale value derived from Thurstone's approach were multiplied together for each item. The resulting scores for the total items quantitatively reflect an individual's attitude based on the responses of the respondents to the scale.

Based on the scores obtained by the respondents, they were categorized into three categories.

Table 6: Criteria for categorizing Agricultural Scientist into different categories

Category	Score range
Low	≤ Mean – SD
Medium	Mean ± SD
High	≥ Mean + SD

The item analysis and other statistical analysis were done using IBM SPSS 16.0 and R.3.1 version.

Table 7: Cronbach's alpha value for each item and the overall scale

Sl. No.	Items	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
1	S1	47.3000	79.459	.883	.949
2	S2	47.8000	82.303	.723	.952
3	S5	47.8000	79.407	.798	.950
4	S6	47.8000	79.614	.783	.951
5	S12	47.7000	82.355	.562	.955
6	S13	47.9000	81.403	.702	.952
7	S15	47.7000	80.700	.806	.950
8	S16	47.7000	81.321	.757	.951
9	S18	48.0000	82.345	.698	.952
10	S19	47.8000	79.821	.768	.951
11	S20	47.9000	80.990	.733	.952
12	S21	47.7000	81.114	.773	.951
13	S23	47.8000	84.372	.553	.955
14	S24	47.7000	79.666	.745	.952
15	S27	48.0000	82.138	.715	.952
16	S28	47.9000	80.162	.796	.950
17	S31	47.3000	79.459	.883	.949
18	S33	47.8000	79.407	.798	.950
19	S37	47.3000	79.459	.883	.949
20	S38	47.3000	79.459	.883	.949
21	S41	47.8000	79.407	.798	.950
22	S44	47.3000	79.459	.883	.949
23	S47	47.3000	79.459	.883	.949
24	S52	47.8000	79.407	.798	.950
25	S56	47.8000	79.407	.798	.950
26	S60	47.8000	79.407	.798	.950
Cronbach's Alpha for the scale = 0.955					

Conclusion

The meticulous development and standardization of the attitude scale for agricultural scientists have resulted in a robust and reliable instrument for assessing their perspectives towards their profession. The scale's successful validation and reliability made it a valuable tool for future research endeavors, offering researchers and practitioners a means to gain deeper insights into the nuanced perspectives of individuals within the agricultural science domain. As we move forward, this developed attitude scale stands as a valuable contribution to the field, providing a reliable framework for understanding and evaluating the attitude of agricultural scientists.

Acknowledgements

The first author is a doctoral research scholar who has produced this article as a result of her doctoral research conducted at Kerala Agricultural University. The research has been financially supported by the university. Nevertheless, the author bears full responsibility for the accuracy of the facts, the expression of opinions, and the formulation of conclusions presented in the article. The comprehensive study carried out by her under the auspices of Kerala Agricultural University delves into the intricate aspects of the subject matter.

References

1. Sarnoff I. Psychoanalytic theory and social attitudes. Public Opin Q. 1960;24:251-279.
2. Eysenck HJ, Crown S. An experimental study in opinion attitude methodology. Int J Opinion-Attitude Res. 1949;3:47-86.
3. Meenambigai J, Lokeshwaran D, Durairaj S. Attitude scale construction methodology in extension education research. In: Recent Trends in Agricultural Extension Research. 2023;1st ed. Chapter 8:66-79.
4. Edwards AL. Techniques of Attitude Scale Construction. New York: Appleton Century Crofts, Inc.; c1957.
5. Thurstone LL, Chave EG. The measurement of attitude. Chicago: University of Chicago Press; c1929. p. 39-40.
6. Wang KA. Suggested criteria for writing attitude statements. J Soc Psychol. 1932;3:367-373.
7. Likert RA. A Technique for the measurement of

attitude. Arch Psychol. 1932;22(140):44-53.
8. Bird C. Social Psychology. New York: Appleton Century Crofts, Inc.; c1940. p. 155.
9. Edwards AL, Kilpatrick FP. A technique for construction of attitude scale. J Appl Psychol. 1948;32:374-384.
10. Thurstone LL, Chave EJ. The Measurement of Attitude: A Psychological Method & Some Experiments with a Scale for Measuring Attitude toward the Church. Chicago, IL, USA: University of Chicago Press; c1929.
11. Abdollahpour E, Nejat S, Nourozian M, Majdzadeh R. The process of content validity in instrument development. Iranian Epidemiol. 2010;6(4):66-74.
12. Wynd CA, Schmidt B, Schaefer MA. Two quantitative approaches for estimating content validity. West J Nurs Res. 2003;25(5):508-518.
13. Cicchetti DV, Sparrow SA. Developing criteria for establishing interrater reliability of specific items: applications to assessment of adaptive behavior. Am J Ment Defic. 1981;86(2):127-137.
14. Cronbach LJ. Coefficient alpha and the internal structure of tests. Psychometrika. 1951;16:297-334.

Appendix

Please put a (✓) mark in any one of the five alternatives provided against each statement to indicate your degree of agreement or disagreement to each statement. [Strongly Agree (SA), Agree (A), Neutral (N), Disagree (D), Strongly Disagree (SD)]

Appendix

Sl. No.	Statements	SA	A	N	D	SD
1	I am enthusiastic in updating the subject matter					
2	I inspire students and arouse interest among them					
3	I have unfriendly and unapproachable behaviour					
4	I always appreciate the efforts of fellow workers					
5	I help students outside class hours					
6	I encourage teamwork					
7	I address problems with secrecy and avoidance					
8	I display impatience and a lack of determination in doing research					
9	I take risk in performing my duties					
10	I devote and dedicate to my research					
11	When it becomes apparent that the task won't be finished on time, I refuse to ask for help when needed					
12	I accept and encourage creativity and innovation					
13	I retain an optimistic mindset by building resilience					
14	I avoid collaborations with local schools and colleges to improve agricultural education					
15	I am flexible and open to new experiences					
16	During working hours, I exclusively perform work-related tasks					
17	I don’t modify methods of working when the initial strategy turns out to be time-consuming					
18	I maintain a “to do” list with priority and deadlines indicated as needed					
19	I keep track of all assignments/responsibilities					
20	I have strong interpersonal skills with farmers and agricultural professionals					
21	I am not interested in doing extension activities					
22	I encourage and empower the future generation of farmers					
23	I often conduct trainings, workshops and classes to farmers					
24	I discourage farmers from using digital technologies in the field					
25	I prioritize scientific truth over grants and financing, leading to fair studies and integrity					
26	I am not always ready to partake in in-service trainings					