AATCC Review

27 March 2025: Received
17 May 2025: Revised
24 May 2025: Accepted
25 June 2025: Available Online

https://aatcc.peerjournals.net/

Original Research Article

Open Access

Development and validation of an Attitude Scale for Assessing Marigold Farmer's Attitude on Marigold Cultivation

Mohammad Monis Ansari* and **Jasbir Singh Manhas**

Sher-e-Kashmir University of Agricultural Sciences and Technology of Jammu, India

ABSTRACT

The focus of the study was to create a valid and reliable scale to know the attitudinal orientation of marigold farmers towards marigold cultivation. The major challenge a research face while developing and standardizing a new scale is measurement error, keeping that in mind; Likert's summative rating technique was used, the items were collected based on attributes of marigold cultivation, and carefully edited. Item responses were obtained on five-point continuum. Item analysis was determined to find out that weather the scale differentiate between the low and high attitude group. Cronbach's Alpha yielded the reliability and was found 0.829, which indicates the scale items has good internal consistency. To know the validity of the measure Content Validity was determined. The Kappa statistics was also employed for the removal of chance agreement. The standardize scale contributes toward a precise and reliable instrument for measuring the attitude within its specified domain. The final scale includes nineteen items.

Highlights:

- *The items of the scale were generated based on attributes of innovation (marigold cultivation).*
- *Item analysis and high Cronbach's alpha confirms a reliable scale, to asses marigold farmer's attitude.*
- *Content validity analysis ensures that the scale item is valid, to asses marigold farmer's attitude.*

Keywords: *Attributes of Innovation, Attitude Scale, Content validity, Cronbach's Alpha, Item analysis, Kappa, Marigold, Reliability*

Introduction

Marigold (*Tagetes*) originates to America, yet cultivated worldwide like countries of Europe, Asia, and Africa [1]. It accounts for over half of the world's loose flowers being amongst the most widely cultivated flower crops [2], [3], [4]. Many species of this genus are cultivated but the Tagetes spp. is widely grown around the world due to its superior quality [5], [1], [6]. Marigold cultivation is an important commercial crop with significant economic potential for farmers of different regions. Tagetes are in demand due to their aromatic quality and significant industrial value lately, the farmers have also shown interest in its cultivation [7]. Research has also shown that it can provide significant income and employment opportunities compared to other traditional crops [8]. In India, marigold is cultivated around 81.54 thousand ha with a production of 923.43 thousand tonnes of flowers, of which 897.24 thousand tonnes are loose and 26.19 thousand tonnes are cut flowers [9]. In the Jammu division, the total area under marigold cultivation is 0.164 thousand ha, producing 1745.2 tonnes of Loose flower [10]. For the present study, the object is conceptualized as Marigold. The adoption of an innovation depends upon how favorable the clientele's attitude is toward the innovation. The study focuses on developing a measure to know the farmers attitude toward marigold cultivation.

*Corresponding Author: ***Mohammad Monis Ansari***

DOI: https://doi.org/10.21276/AATCCReview.2025.13.03.295

Materials and Methods

Attitude is a tendency towards behavior, not an unseen mental condition, but consistent, observable pattern of thoughts, emotions, or actions directed at a particular object or idea [11]. For the present study attitude was conceptualized as the feeling (positive or negative) towards marigold cultivation based on attributes of marigold cultivation.

The theory of attributes suggests that individual adopt innovations when they have a positive attitude toward it, believe it adds value, easy to use, and fit the existing system. Research on farmer's attitude shows significant focus on their views towards various crops, yet less attention has been given to how innovation attributes shape these attitudes, influencing the overall adoption process. Rogers [12], [13], defines relative advantages as how much better innovation is compared to what it replaces, with subdimensions like profitability, low cost, social prestige, time saving, comfort and immediate results, though not all benefits are evident pre-implementation. Compatibility reflects alignment with individuals (adopter's) needs, values, and norms. Complexity indicates how challenging an innovation is to comprehend, and use. Trialability is the degree to which an innovation can be experimented on a limited basis before its full adoption, while observability is how easily visible is the result of the innovation. Except the complexity all the other four attributes (relative advantages, compatibility, trialability and observability) positively influence innovation diffusion [14].

The scale construction consisted of the following steps: collection of items, editing and correction of items, number of items, item scaling, pretesting, item analysis, reliability, and validity.

Collection of Items
For the construction of the scale, a pool of items was generated about marigold cultivation based on attributes of innovation from secondary sources like books, bulletins, magazines, research papers, and conducting discussions with experts as well as subject matter specialist [12]. Initially 46 statements were prepared.

Editing and Correction of Items
The initial prepared statements underwent a review and revision process and carefully edited, revised, and restructured exercising the 14 criteria [15]. After getting comments from the experts and subject matter specialist, the items were corrected based on those comments. A careful revision was done to evade the misinterpretation while understanding the content and meaning of each statement before administering the items to the respondents.

Number of items
After rigorous revision 28 statements were retained for further analysis.

Item scaling
Likert's summated rating scale was used from various available scale construction techniques. Five-point continuum response was used for the items i.e. Strongly Agree to Strongly Disagree [16].

Pretesting
The scale having 28 items was administered to 24 marigold growers (non-sampled) on five-point psychological continuum.

Results and Discussions
Item Analysis
To construct of a valid and reliable scale item analysis is an important step. For each positive items the scores were assigned as 5,4,3,2,1, and for each negative items reverse scoring was done for the calculation of the t value. By summing up all the score obtain on all items the respondents overall score was obtained. The arrangement of the respondents was done in descending order based on the score obtained. Further, 25 percent of the respondents i.e. 6 famers from each; i.e. group with high attitude and the group low attitude. The critical ratio (t value) to find out the extent to which an item differentiates among the low attitude and high attitude groups.
Edwards formula used for item analysis [17]:

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

Where;

$$\Sigma(X_H - \bar{X}_H)^2 = \frac{\sum X_H^2 - (\sum X_H)^2}{n}$$

and,

$$\Sigma(X_L - \bar{X}_L)^2 = \frac{\sum X_L^2 - (\sum X_L)^2}{n}$$

Whereas,

ΣX_H^2 = Sum of the squares of the individual scores in the high groups.

ΣX_L^2 = Sum of the squares of the individual scores in the low groups.
$\bar{X}_H$ = The mean score on a given statement for the high group.
$\bar{X}_L$ = The mean score on a given statement for the low group.
n = Total respondents in individual (Low and High) groups.

Selection of Items
The items (statements) having a critical ratio (t value) 1.75 or above were retained.

Standardization of scale
Reliability and content validity of the measure was assessed.

Reliability
The reliability is the degree of consistency and, the degree to which a measurement produces consistent results or scores each time it is used, assuming the underlying concept being evaluated remains unchanged. Internal consistency reliability, the main approach for assessing reliability in multi-item scales, offers insight into how well the various items within the scale relate to one another [18]. The alpha of the scale of 19 items was found to be 0.829 and the alpha based on standardized items was 0.840. The alpha score of 0.829 for the scale exhibits that the scale has good reliability.

Validity
Validity is the degree of accuracy, how accurately a measuring device measures what it tends to measure. To know the validity, the content validity method was used, that was quantified in two steps: first the content validity ratio (CVR), followed by the content validity index (CVI) was computed employing Item content validity index (I-CVI) and Scale Content Validity Index (S-CVI) respectively.

Step 1: Content Validity Ratio (CVR)
CVR is used for individual items of the measure [19]. The CVR ascertain if each item is essential for assessing the construct being measured. A panel consisting experts and subject matter specialists was asked to rate items of the measure as either "essential," or "not essential" for the scale with scores assign as of 1 for “essential” and 0 for “not essential” [20].

Table 1: CVR critical values [19]

No. of Experts	7	10	11	15	20	25	30	35	40
Minimum value	0.99	0.78	0.59	0.49	0.42	0.37	0.33	0.31	0.29

The formula used for CVR:

$$\text{CVR} = \frac{\text{n}\,e - \frac{\text{N}}{2}}{\frac{\text{N}}{2}}$$

ne = total judges ratting an item as "essential"
N = total number of judges.
Since the total Judges involved in the process was 15, then according to Lawshe the items having the CVR above 0.49 was retained and the items having CVR below 0.49 were discarded.

Step 2: Content Validity Index (CVI)
The CVI of the scale was calculated by I-CVI (for all individual items) and S-CVI (for overall scale) [20]. For CVI, the panel was asked to rate each scale item scoring from 1,2,3,4 for not relevant, somewhat relevant, quite relevant, and highly relevant respectively. The S-CVI score of a measure range from 0 to 1, higher value indicates that the scale has greater content validity.
Formula used:

I-CVI = (total judges giving an item rating 3 or 4) / (total judges in a panel)
S-CVI = Σ (I-CVI) / n
n = total no. of items
The acceptable threshold for content validity is an S-CVI of 0.80 or higher [21], [22], [23]. The S-CVI of the scale was found to be 0.90, which was well above the accepted threshold. Thus, the scale was found with high content validity.

Kappa Statistics

Multi-rater kappa statistics was also used in addition to CVI, it substitutes any random chance agreement thus ensuring a better understanding of content validity. Kappa statistic supplements CVI by ensuring that the expert's agreement is beyond chance [24]. Before computation of Kappa Statistic, it is required to calculate the probability of chance agreement.

The formula used

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

Whereas,
Pc = probability of chance agreement
N = number of experts in the panel,
A = number of experts in the panel who agree that the item is relevant
The formula used for Kappa statistic:

$$K = \frac{I - CVI - P_C}{1 - P_C}$$

The Kappa value of the scale items ranges from 0.86 – 1. Since the kappa was above the threshold of 0.74 it was considered excellent.

Table 2: All the statistical values of the final selected items of the scale

Item	't' value	Reliability	CVR	I-CVI	S-CVI	Pc	Kappa
1	1.96	Cronbach's Alpha for the scale = 0.829	1	1	S-CVI = 17.15 / 19 S-CVI = 0.90	0.000031	1
2	1.83		0.87	0.93		0.000457	0.93
3	2.85		0.6	0.80		0.0138	0.80
4	1.91		0.73	0.86		0.0032	0.86
5	3.86		0.73	0.86		0.0032	0.86
6	2.27		0.87	0.93		0.000457	0.93
7	2.79		0.87	0.93		0.000457	0.93
8	3.07		1	1		0.000031	1
9	2.39		0.6	0.80		0.0138	0.80
10	2.67		0.6	0.80		0.0138	0.80
11	2.33		0.6	0.80		0.0138	0.80
12	2.27		0.73	0.86		0.0032	0.86
13	2.79		1	1		0.000031	1
14	3.07		1	1		0.000031	1
15	2.39		0.87	0.93		0.000457	0.93
16	3.19		0.73	0.86		0.0032	0.86
17	3.19		0.87	0.93		0.000457	0.93
18	2.71		0.87	0.93		0.000457	0.93
19	1.85		0.87	0.93		0.000457	0.93

Conclusion

In the construction of the scale, Item analysis, reliability, and validity were determined to find the instrument's stability, the outcome revealed that the scale items discriminate well between Low attitude and high attitude groups and the instrument is reliable and valid. Hence, it shows that the final selected items have a good statistical fit for assessment of farmer's attitude towards marigold cultivation. Nineteen scale items were retained.

Future scope of the study

Beside the content validity of the attitude scale items, construct validity can also be used to assess the validity of the scale.

Conflict of Interest

None.

Acknowledgement

The authors express gratitude to all participants for their involvement in the research.

References

1. Salehi B, Valussi M, Morais-Braga MFB, Carneiro JNP, Leal ALAB, Coutinho HDM, and Sharifi-Rad J. 2018. Tagetes spp. essential oils and other extracts: Chemical characterization and biological activity. *Molecules*, 23(11): 2847.
2. Hou Z, Liu J, Cai M, Liu Y, Zhang M, Wang L, Yang W, and Huang B. 2023. The volatile organic compounds and palatability of mixed ensilage of marigold (*Tagetes erecta L.*) crop residues. *Scientific Reports*, 13(1): 2080.
3. Hou Z, Liu J, Cai M, Liu Y, Mu L, Gao Y, Wanapat M, and Huang B. 2021. Enriching the nutritive value of marigold (*Tagetes erecta L*) crop residues as a ruminant feed by lactic acid bacteria during ensilage. *BMC Veterinary Research*, 17: 1-10.
4. Baskaran V, and Abirami K. 2017. Effect of pinching on yield of African marigold (*Tagetes erecta L.*) cv. Pusa Narangi Gainda under Andaman conditions. *Agricultural Science Digest-A Research Journal*, 37(2): 148-150.
5. Joshi D, Awasthi P, and Rizal G. 2022. Impact of pinching on growth and yield of Marigold (*Tagetes erecta L.*). *Environment & Ecosystem Science (EES),* 6(1): 34-38.
6. Singh R, Sisodia A, Singh AK, and Pal AK. 2018. Effect of pinching, gibberellic acid and kinetin on growth, flowering and seed yield in marigold. *Journal of Pharmacognosy and Phytochemistry*, 7(3): 3318-3320.

7. Walia S, and Kumar R. 2020. Wild marigold (*Tagetes minuta L.*) an important industrial aromatic crop: liquid gold from the Himalaya. *Journal of Essential Oil Research*, 32(5): 373-393.

8. Kaur M, Bhat A, Sadik-Zada ER, and Sharma R. 2022. Productivity analysis and employment effects of marigold cultivation in Jammu, India. *Horticulturae*, 8(3): 263.

9. DoAFW. 2023. Area and Production of Horticulture Crops 2021-22 (Final). Department of Agriculture and Farmers Welfare (DoAFW). Available at: https://agricoop.gov.in/en/StatHortEst. Accessed on 25 July, 2023

10. DoF. 2023. Office communication record through Department of Floriculture, Jammu on 11 April 2023.

11. Ryle G. (1949). The Concept of Mind. London: Hutchinson. p. 334.

12. Rogers EM. 1962. Diffusion of Innovations. The Free Press of Glencoe, New York. pp. 891-937

13. Rogers EM. (2003). Diffusion of Innovations (5th ed.). New York: Free Press. p. 551.

14. Swanson R A, and Houlton EF. 2005. Research in organizations: Foundations and methods in inquiry. Berrett-Koehler Publishers, p. 459.

15. Edwards AL. 1969. Techniques of attitude scale construction. Vikas and Simon Private Ltd. Ballard Estate, Mumbai, pp. 26-28.

16. Likert R. 1932. A technique for the measurement of attitude. Archives of Psychology, 140: 28-48.

17. Edwards AL. 1957. Techniques of attitude scale construction. Appellation Century Crafts, Inc., New York, pp. 15-22

18. Frost MH, Reeve BB, Liepa AM, Stauffer JW, Hays RD, and Mayo/FDA Patient-Reported Outcomes Consensus Meeting Group. 2007. What is sufficient evidence for the reliability and validity of patient-reported outcome measures? *Value in Health*, 10: S94-S105.

19. Lawshe CH. 1975. A quantitative approach to content validity. Personnel psychology, 28: 563-575.

20. Ansari MM, and Khan S. 2023. An In-Depth Examination of Validity Assessment: Exploring Diverse Methodologies and Dimensions of Validity in Social Research Studies. *Asian Journal of Agricultural Extension, Economics & Sociology*, 41(10): 772-782.

21. Ansari MM, Manhas JS, and Parihar P. 2024. Development of knowledge test to measure the knowledge level of marigold farmers on marigold cultivation practices. *Gujarat Journal of Extension Education*, 38(1): 163-168.

22. Khan S, Parihar P, Manhas JS, and Ansari MM. 2024. Development of knowledge test to measure the knowledge level of farmers on interventions of the NICRA project for climate change adaptation. *International Journal of Agriculture Extension and Social Development*, 7(11). 162-166.

23. Shrotryia VK, and Dhanda U. 2019. Content validity of assessment instrument for employee engagement. *Sage Open*, 9(1): 1-7.

24. Wynd CA, Schmidt B, and Schaefer MA. 2003. Two quantitative approaches for estimating content validity. *Western journal of nursing research*, 25(5): 508-518.