

## A SCALE TO MEASURE THE ATTITUDE OF FARMERS TOWARDS PM-KUSUM YOJANA

Swadesh Mourya<sup>1</sup>, Abhijeet Sarje<sup>2</sup> and Mahesh R. Patel<sup>3</sup>

1 Master Student, Dept. of Agricultural Extension and Communication, BACA, AAU, Anand – 388110

2 PhD Scholar, Dept. of Agricultural Extension and Communication, BACA, AAU, Anand – 388110

3 Professor, Directorate of Extension Education, BACA, AAU, Anand – 388110

Email: swadeshmaurya23@gmail.com

### ABSTRACT

*Agriculture in India is highly dependent on energy-intensive irrigation systems, largely powered by diesel and grid electricity, which contribute to greenhouse gas emissions and increase the financial burden on farmers. To promote sustainable energy use in agriculture, the Government of India launched the Pradhan Mantri Kisan Urja Suraksha evam Utthaan Mahabhiyan (PM-KUSUM) Yojana, encouraging the adoption of solar irrigation pumps through subsidies and incentives. The success of such schemes largely depends on farmers' attitudes, making it essential to develop a reliable and valid instrument to measure them. The present study aimed to develop and standardize an attitude scale to measure farmers' attitudes towards the PM-KUSUM Yojana. The scale was constructed using the Scale Product Method, combining Thurstone's Equal Appearing Interval technique for statement selection and Likert's summated rating method for response measurement. Initially, 20 statements were collected from literature, experts, and field experience; after scrutiny, 16 statements were retained and subjected to judgment by 50 experts. Based on median (scale) values and inter-quartile range (Q), 12 statements were finally selected for inclusion in the scale. The reliability of the scale was tested using the split-half method and Rulon's formula, yielding a reliability coefficient of 0.85, indicating high reliability. Content validity was established through expert consultation. The developed attitude scale was found reliable and valid. The scale can be effectively used in future studies to assess farmers' attitudes towards PM-KUSUM and similar renewable energy interventions in agriculture.*

**Keywords :** PM-KUSUM Yojana, attitude scale, renewable energy in agriculture, scale product method, farmers' perception

### INTRODUCTION

Agriculture continues to be the backbone of India, supporting nearly 70 per cent of the population and relying heavily on energy-intensive irrigation systems. The sector's dependence on diesel and grid electricity has contributed to rising greenhouse gas emissions and increasing financial pressure on both farmers and electricity utilities (Moriarty and Honnery, 2016). Recognizing the need for cleaner and more sustainable energy alternatives, the Government of India launched the Pradhan Mantri Kisan Urja Suraksha evam Utthaan Mahabhiyan (PM-KUSUM) scheme to promote solar-based irrigation. The scheme provides significant subsidies for Solar Irrigation Pumps (SIPs) and allows farmers to sell surplus energy, thereby improving energy security and offering an additional income source (Dutt and Krishnan, 2023).

Gujarat, known for its strong renewable energy potential and progressive energy policies, offers a favorable environment for the effective implementation of the PM-KUSUM scheme (Tabassum and Shastry, 2021). Research indicates that states with high solar irradiance and supportive policy frameworks experience higher adoption of solar technologies

in agriculture. However, the overall success of PM-KUSUM depends largely on farmers' attitudes, which are shaped by their awareness, perceived benefits, financial considerations, and trust in government initiatives. Studies have shown that positive farmer attitudes significantly enhance the uptake of renewable energy technologies, whereas skepticism or lack of information can hinder adoption despite available subsidies (Kumar *et al.*, 2024).

Therefore, assessing farmers' attitudes toward the PM-KUSUM Yojana is essential for identifying existing gaps, strengthening policy implementation, and ensuring that the scheme effectively supports both sustainable agriculture and rural energy transitions. A deeper understanding of these attitudes will help refine strategies that encourage wider acceptance of solar irrigation among farmers, ultimately contributing to environmental sustainability and improved agricultural productivity.

### OBJECTIVE

To develop the scale to measure attitude of farmers towards PM-KUSUM Yojana

## METHODOLOGY

Attitude refers to the degree of positive or negative effects of an individual associated with some psychological object (Thurstone, 1946; Patel *et al.*, 2023). Development of attitude scale to measure the degree of positive or negative feelings of the farmers towards PM-KUSUM, a scale was developed by adopting systematic methodology. Among the techniques available, researcher had selected. 'Scale product method' which combines the Thurstone's technique of equal appearing interval scale (1928) for selection of items and Likert's technique of summated rating (1932) for ascertaining the response on the scale as proposed by Eysenck and Crown (1949) and also as followed by Patel *et al.* (2022a).

### Steps in development of attitude scale

#### (1) Item collection

The items making up an attitude scale are known as statements. A statement may be defined as anything that is said about a psychological object as a first step in developing the scale 20 statements were collected from relevant literature, field extension personnel, relevant specialists, discussion with major guide and the researcher's own experience. The collected statements were corrected according to the following criteria laid down by Thurston and Chave (1928), Likert (1932) and Edward and Kilpatrick (1948) and finally 16 statements selected as they were found to be non-ambiguous. As followed by Patel *et al.* (2022<sub>b</sub>) and Behera *et al.* (2024).

#### (2) Judges' rating of attitude statements

In order to judge the degree of 'Unfavourableness' to 'Favourableness' of each statement on the five-point equal appearing interval continuum, a panel of fifty judges was selected. Selected statements were given to the experts working in Department of Extension Education and Directorate of Extension Education of various SAUs and Extension Education Institutes through Google form. The judges were requested to judge each statement in terms of their most agreement or most disagreement with the statements with the five equal appearing interval continuums. All forms given to the experts returned after duly recording their judgments and were considered for the analysis. The judges were contacted personally through telephonic call and instructions. As followed by Patel *et al.* (2022<sub>c</sub>) and Vinaya *et al.* (2016).

#### (3) Determination of scale and quartile value

The five points of the rating scale were assigned with a score ranking from 1 for most unfavourable (most

disagreement) and 5 for most favourable (most agreement). Based on the judgment of the 50 judges for each statement, the Median value or Scale value (S value) of the distribution and the Quartile (Q) value for the statement were calculated for each statement. Then the interquartile range was worked out by taking the difference between  $C_{75}$  ( $Q_3$ ) and  $C_{25}$  ( $Q_1$ ), that means  $Q = C_{75} - C_{25}$  for each statement. After that S value and Q values of each statement were used to decide whether the particular statement should be a part of attitude scale or not.

The median value (S value) of the distribution and the Quartile (Q) value for the statement concerned were calculated with the help of following formulas.

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

Where,

S = Scale value

L = The Lower limit of the interval in which the median falls

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

Pw = 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).

Thurstone and Chave (Edwards, 1957) used the inter-quartile range Q as a means of the variation of the distribution of the judgments for a given statement. To determine value of Q, two other point were measured, the 75th centile and 25th centile.

The 25th centile was obtained by the formula.

$$C_{25} = L + \frac{0.25 - \Sigma Pb}{Pw} \times i$$

Where,

C25 = The median or scale value of the statement

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

$\Sigma Pb$  = The sum of the proportion below the interval in which the 25<sup>th</sup> centile falls

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

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

The 75th centile was obtained by the following formula.

$$C_{75} = L + \frac{0.75 - \Sigma Pb}{Pw} \times i$$

Where,

C75 = The median or scale value of the statement

L = The Lower limit of the interval in which the 75th centile falls

$\Sigma Pb$  = The sum of the proportion below the interval in which the 75th centile falls

Pw = The proportion within the interval in which the 75th centile falls

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

Then the interquartile range would be given by taking the difference between C75 and C25, thus,

$$Q = C75 - C25$$

In this manner, the interquartile range (Q) for each statement was worked out for determinations of ambiguity involved in the statements. Only those statements were selected whose median values were greater than Q value.

#### (4) Procedure to select final statements to measure attitude

The data from the 50 judges were arranged in the form as shown below in Table 1. The table shows the frequency distribution of judgments made by the judges for the statement no. 3 on five categories.

**Table 1: Frequency distribution of judgment made by the judges on five categories for statement no. 3**

(n = 50)

| Sr. No.      | Distribution of the judgment for the Statement no. 3 |                | Frequency |
|--------------|------------------------------------------------------|----------------|-----------|
| 1            | Strongly agree                                       | II             | 2         |
| 2            | Agree                                                | IIII IIII IIII | 15        |
| 3            | Undecided                                            | IIII IIII III  | 13        |
| 4            | Disagree                                             | IIII IIII IIII | 14        |
| 5            | Strongly disagree                                    | IIII I         | 6         |
| <b>Total</b> |                                                      |                | <b>50</b> |

Here Table 1 indicate that out of 50 judges, 2 judges were strongly agreed and believed that the statement no. 3

(I feel that PM-KUSUM Yojana encourages the use of solar energy in farming. (+) should be a part of the scale, while 15, 13, 14 and 6 of them were agreed, undecided, disagreed and strongly disagreed.

**Table 2: Summary of judgments made by judges on five categories for statement no. 3**

(n = 50)

| Statement no. 3 | Sorting categories |      |      |      |      | Scale value | Q Value |
|-----------------|--------------------|------|------|------|------|-------------|---------|
|                 | 1                  | 2    | 3    | 4    | 5    |             |         |
| <b>F</b>        | 2                  | 15   | 13   | 14   | 06   | 3.12        | 1.83    |
| <b>P</b>        | 0.04               | 0.30 | 0.26 | 0.28 | 0.12 |             |         |
| <b>Cp</b>       | 0.04               | 0.34 | 0.60 | 0.88 | 1.00 |             |         |

**\*\*NOTE f = frequency, p = Proportions, CP = Cumulative proportions**

As shown in Table 2, three rows were used for each statement. The first row gives the Number distribution (f) with which the statement was placed in each of the five categories. The second row shows the proportions (p) of these frequencies, viz. 02/50=0.04, 15/50=0.30, 13/50=0.26, 14/50=0.28 and 06/50=0.12. This way proportions are obtained by dividing each number by a total number of judges (n=50). The third row gives the cumulative proportions (Cp) that are the proportion of the judgments in a given category plus the sum of all the proportions below that category, viz. Cp of category 1 is 0.04, for 2nd it is 0.4+0.30=0.34, for 3rd 0.34+0.26=0.60, for 4th it is 0.60+0.28=0.88 and for 5th it is 0.88+0.12=1.00 If the median of the distribution of the judgment for each statement is taken as the scale value of the statement, then the scale values can be found from the data arranged in the Table 3, by means of the following formula. As followed by Vinaya & Gadde (2026).

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

Where,

S = Scale value

L = The Lower limit of the interval in which the median falls

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

Pw = 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).

Substituting in the above formula to find out the scale value

for the statement number 3 in Table 2: we have

$$L = 2.5$$

$$\sum Pb = 0.34$$

$$pw = 0.26$$

$$i = 1$$

$$S = 2.5 + \frac{0.50 - 0.34}{0.26} \times 1$$

$$= 2.5 + 0.61$$

$$= 3.12$$

The scale value can be found in the same manner for the other statements.

Thurstone and Chave (Edwards, 1957) used the inter-quartile range Q as a means of the variation of the distribution of the judgments for a given statement. To determine value of Q, two other point were measured, the 75<sup>th</sup> centile and 25<sup>th</sup> centile. The 25<sup>th</sup> centile 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 statement

L = The Lower limit of the interval in which the 25<sup>th</sup> centile falls

$\sum Pb$  = The sum of the proportion below the interval in which the 25<sup>th</sup> centile falls

Pw = The proportion within the interval in which the 25<sup>th</sup> centile falls

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

For the statement number 3 in table 2: we have

$$L = 1.5$$

$$\sum Pb = 0.04$$

$$pw = 0.30$$

$$i = 1$$

$$= 1.5 + \frac{0.25 - 0.04}{0.30} \times 1$$

$$= 1.5 + 0.70$$

$$C_{25} = 2.20$$

The 75<sup>th</sup> centile 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 statement

L = The Lower limit of the interval in which the 75<sup>th</sup> centile falls

$\sum Pb$  = The sum of the proportion below the interval in which the 75<sup>th</sup> centile falls

Pw = The proportion within the interval in which the 75<sup>th</sup> centile falls

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

For the statement number 3 in table 2: we have,

$$L = 3.5$$

$$\sum Pb = 0.60$$

$$pw = 0.28$$

$$i = 1$$

$$C_{75} = L + \frac{0.75 - \sum Pb}{Pw} \times i$$

$$= 3.5 + \frac{0.75 - 0.60}{0.28} \times 1$$

$$= 3.5 + 0.53$$

$$C_{75} = 4.03$$

Then the interquartile range would be given by taking the difference between  $C_{75}$  and  $C_{25}$ , thus,

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

Substituting the values

$$Q = 4.03 - 2.20$$

$$Q = 1.83$$

In this manner, the interquartile range (Q) for each statement was worked out for determinations of ambiguity involved in the statements. Only those statements were selected whose median values were greater than Q value. In case of statement 3, S = 3.12 and Q = 1.83 Hence the statement number 3 was selected.

**Table 3: Method for selecting the statements for the scale based on scale value and inter-quartile range**

| Statement Number | Scale Value (S) | Interquartile value (Q) | Selected/Not selected |
|------------------|-----------------|-------------------------|-----------------------|
| 3                | 3.12            | 1.83                    | selected              |
| 8                | 3.00            | 2.31                    | selected              |
| 9                | <b>2.43</b>     | <b>2.47</b>             | <b>Not selected</b>   |
| 5                | 2.28            | 1.40                    | selected              |
| 10               | <b>2.26</b>     | <b>2.36</b>             | <b>Not selected</b>   |
| 6                | 2.20            | 1.44                    | selected              |
| 7                | 2.10            | 1.25                    | selected              |
| 11               | 2.05            | 1.62                    | selected              |
| 1                | 2.02            | 1.06                    | selected              |
| 16               | 1.98            | 0.81                    | selected              |
| 13               | <b>1.98</b>     | <b>1.01</b>             | <b>Not selected</b>   |
| 12               | 1.92            | 1.28                    | selected              |
| 15               | <b>1.85</b>     | <b>1.86</b>             | <b>Not selected</b>   |
| 4                | 1.84            | 1.15                    | selected              |
| 14               | 1.75            | 1.20                    | selected              |
| 2                | 1.69            | 1.19                    | selected              |

Thurstone and Chave (1928) described another criterion in addition to Q as a basis for rejecting or accepting statement to include in scales constructed by the method of the

equal appearing interval. Accordingly, when a few statements have the same scale values, the statement having lowest Q value were selected. To select the statements on this criterion table 5, explain the procedure. The statement in Table 3, have been arranged as per ascending scale value.

Based on the median and Q values, out of 16 statements 12 statements numbering 1, 2, 3, 4, 5, 6, 7, 8, 11, 12, 14, and 16 of the original lists were finally selected to constitute attitude scale to measure the attitude of farmers towards PM-KUSUM Yojana.

#### Final format of attitude scale

When there was a good agreement among the judges, in judging the degree of agreement or disagreement of a statement, Q was smaller compared to the scale value obtained. Thus, only those statements were selected who's median (scale) values were greater than Q values. However, when a few statements had the more or less similar scale values, statements having lowest Q value were selected and also with 0.10 difference on S value and make group on the basis of them, from this group only those statements were selected whose Q values lower than other. Based on the median and Q values, 12 statements numbering 3, 8, 5, 6, 7, 11, 1, 16, 12, 15, 4, 14 and 2 of the original lists were finally selected to constitute attitude scale. The scale values ranged from 1.69 to 3.12 and the following statement are selected.

**Table 4: Selected statements for research study**

| Sr. No. | Statements                                                                                           | SA | A | UD | DA | SDA |
|---------|------------------------------------------------------------------------------------------------------|----|---|----|----|-----|
| 1       | I feel that PM-KUSUM Yojana encourages the use of solar energy in farming. (+)                       |    |   |    |    |     |
| 2       | I believe PM-KUSUM Yojana helps me to save electricity costs. (+)                                    |    |   |    |    |     |
| 3       | I find it hard to take benefit from PM-KUSUM Yojana. (-)                                             |    |   |    |    |     |
| 4       | I think PM-KUSUM Yojana's effectiveness depends on the climate in my region. (-)                     |    |   |    |    |     |
| 5       | I don't think PM-KUSUM Yojana promotes sustainable farming practices. (-)                            |    |   |    |    |     |
| 6       | I feel more confident in using renewable energy because of PM-KUSUM Yojana. (+)                      |    |   |    |    |     |
| 7       | I believe that PM-KUSUM Yojana is more beneficial in long-term (+)                                   |    |   |    |    |     |
| 8       | I feel that the subsidy provided through PM-KUSUM Yojana doesn't cover all expenses. (-)             |    |   |    |    |     |
| 9       | I think the PM-KUSUM Yojana is effective in reducing the use of diesel and electricity on farms. (+) |    |   |    |    |     |
| 10      | I believe that the process of getting benefits from PM-KUSUM Yojana takes too much time. (-)         |    |   |    |    |     |
| 11      | I believe the benefits of the PM-KUSUM Yojana are not reaching the truly needy farmers. (-)          |    |   |    |    |     |
| 12      | I feel that the technical support provided under the PM-KUSUM Yojana is insufficient. (-)            |    |   |    |    |     |

SA= Strongly Agree, A= Agree, UD= Undecided, D= Disagree, SD= Strongly Disagree

**Method of scoring**

The twelve statements selected for the final format of the attitude scale were randomly arranged to avoid response bias, which might contribute to low reliability and reduce validity of the scale. Out of the 12 statements, five statements were positive attitude statements and seven statements indicated negative against these 12 statements, there were five columns representing five points continuums of agreement and disagreement to the statements as followed by Likert (1932) in his summated rating technique of attitude measurement. The five points on continuum were strongly agreed, agree, undecided, disagree and strongly disagree with respective weights of 5, 4, 3, 2, and 1 for the positive or favourable statements and of 1, 2, 3, 4 and 5 weights for the negative unfavourable statements. The weight of Likert's technique and the scale value of Thurstone technique were combined in the form of a product and the total score for an individual was the sum of the product.

**Reliability of the scale**

A scale is reliable when it consistently produces the same results when it applied to the same sample. In the present study, due to limited time and resources available to the researcher, only split-half method of testing reliability was used.

The 12 statements were divided into two halves with 6 odd numbered in one half and 6 even-numbered statements in the other. These were administered to 20 respondents. Each of the two sets of statements were treated as a separate scale and then these two sub-scales were correlated. The co-efficient of reliability was calculated by the Rulon's formula (Guilford, 1954), and correction factor which came to be 0.85. Thus, the scale developed was found highly reliable. To understand this procedure, we can examine the statements for the scale in table 5.

**Table 5: Reliability of scale**

| Respondents  | Score of odd state. | Score of even state. | d<br>( $X_o - X_e$ ) | d <sup>2</sup> | t<br>( $X_o + X_e$ ) | t <sup>2</sup> |
|--------------|---------------------|----------------------|----------------------|----------------|----------------------|----------------|
| 1            | 22                  | 22                   | 0                    | 0              | 44                   | 1936           |
| 2            | 20                  | 14                   | 6                    | 36             | 34                   | 1156           |
| 3            | 19                  | 17                   | 2                    | 4              | 36                   | 1296           |
| 4            | 20                  | 26                   | -6                   | 36             | 46                   | 2116           |
| 5            | 22                  | 23                   | -1                   | 1              | 45                   | 2025           |
| 6            | 19                  | 23                   | -4                   | 16             | 42                   | 1764           |
| 7            | 18                  | 24                   | -6                   | 36             | 42                   | 1764           |
| 8            | 18                  | 17                   | 1                    | 1              | 35                   | 1225           |
| 9            | 18                  | 19                   | -1                   | 1              | 37                   | 1369           |
| 10           | 20                  | 17                   | 3                    | 9              | 37                   | 1369           |
| 11           | 29                  | 28                   | 1                    | 1              | 57                   | 3249           |
| 12           | 26                  | 23                   | 3                    | 9              | 49                   | 2401           |
| 13           | 28                  | 28                   | 0                    | 0              | 56                   | 3136           |
| 14           | 30                  | 29                   | 1                    | 1              | 59                   | 3481           |
| 15           | 20                  | 15                   | 5                    | 25             | 35                   | 1225           |
| 16           | 19                  | 14                   | 5                    | 25             | 33                   | 1089           |
| 17           | 23                  | 22                   | 1                    | 1              | 45                   | 2025           |
| 18           | 22                  | 13                   | 9                    | 81             | 35                   | 1225           |
| 19           | 24                  | 28                   | -4                   | 16             | 52                   | 2704           |
| 20           | 18                  | 22                   | -4                   | 16             | 40                   | 1600           |
| <b>Total</b> |                     |                      | <b>11</b>            | <b>315</b>     | <b>859</b>           | <b>38155</b>   |

Rulon's Formula:

$$rtt = 1 - \frac{\sigma^2 d}{\sigma^2 t}$$

Where;

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

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

Calculation:

$$\sum d = 11$$

$$\sum d^2 = 315$$

$$t = 859$$

$$\sum t^2 = 38155$$

$$N = 20$$

$$\sigma^2 d = \frac{\sum d^2 - \frac{(\sum d)^2}{20}}{20}$$

$$\sigma^2 d = \frac{315 - \frac{(11)^2}{20}}{20}$$

$$= 15.44$$

$$\sigma^2 t = \frac{\sum t^2 - \frac{(\sum t)^2}{20}}{20}$$

$$\sigma^2 t = \frac{38155 - \frac{(859)^2}{20}}{20}$$

$$= 63.04$$

$$rtt = 1 - \frac{\sigma^2 d}{\sigma^2 t}$$

$$= 1 - \frac{15.44}{63.04}$$

$$= 0.2449 = 0.8626$$

$$= 0.75$$

Correction factor

$$rtt = \frac{2roe}{1 + roe}$$

$$rtt = \frac{2(0.75)}{1 + 0.75}$$

$$rtt = 0.85$$

### Content validity of the scale

The validity of the scale examined for content validity by determining how well content was selected by discussing it with 20 specialists of extension and academicians of Anand agricultural university. Thus, the present scale was also satisfied the content validity.

### CONCLUSION

The attitude scale developed was found to be reliable and valid. The attitude scale developed was administered on 120 farmers of a sample area, it can be concluded that the scale developed was useful in measuring the attitude of farmers towards PM-KUSUM Yojana. Hence, researcher can use this scale in future for measuring the attitude of farmers in similar studies.

### ACKNOWLEDGEMENT

I express my gratitude to Anand Agricultural University for providing the research platform and resources for this study.

### CONFLICT OF INTEREST

All authors declare that they have no conflict of Interest

### REFERENCES

- Behera, B., Kumari, A. and Mallick B. (2024) Impact of Pradhan Mantri Ujjwala Yojana on improving the socio-economic status of women. *Gujarat Journal of Extension Education*, 38(2):7-12. <https://doi.org/10.56572/gjoe.2024.38.2.0002>.
- Dutt, A. & Krishnan, D. S. (2023). Mapping the impacts of solar water pumps on farmers' lives: building a results framework for components A and C of Pradhan mantri kisan urja suraksha evam utthaan mahabhiyan (PM Kusum). *World resource institute*, (1), 1-22.
- Edward, A. L. and Kilpatrick, F. P. (1948) A technique for the construction of attitude scale. *J. of Appl. Psychol.* 32 (4): 374-384.
- Guilford, J. P. (1954) *Psychometric Methods*. Tata Mc GrawHill Publication Co. Ltd., Bombay, pp. 378-382.
- Kumar, A., Manhas, J. S., & Lal, B. (2025). *A scale to measure perception of farmers towards weather based agro-advisory services*. *Gujarat Journal of Extension Education*, 39(2), 146–151. <https://doi.org/10.56572/gjoe.2025.39.2.0025>

- Kumar, S. M., Lad, Y. A. & Pundir, R. S. (2024). Factors influencing farmers' adoption of solar water-pumping systems in Gujarat. *Clean Energy*, 8 (3), 157-165.
- Likert, R. A. (1932) A technique for the measurement of attitude scale, *Arch. Psychol.*
- Moriarty, P. & Honnery, D. (2016). Can renewable energy power the future? *Energy policy*, 93, 3-7.
- Patel M. R., Vinaya Kumar H. M. and Chauhan N. B. (2022a). A scale to measure self-confidence of rural youth about floriculture farming. *Guj. J. Ext. Edu.* 34 (2): 128-130. <https://doi.org/10.56572/gjoe.2022.34.2.0028>
- Patel M. R., Vinaya Kumar H. M. and Chauhan N. B. (2022b). A scale to measure self-confidence of rural youth about orchard farming. *Guj. J. Ext. Edu.* 34 (2): 28-30. <https://doi.org/10.56572/gjoe.2022.34.2.0007>
- Patel M. R., Vinaya Kumar H. M. and Chauhan N. B. (2022c). A scale to measure self-confidence of rural youth about vegetables farming. *Guj. J. Ext. Edu.* 34 (1): 50-52. <https://doi.org/10.56572/gjoe.2022.34.1.0010>
- Tabassum, Z. & Shastry, C. (2021). Renewable energy sector in Gujarat, India. *Small hydro power*, (23), 1028-1040.
- Thurstone, L. L. (1946) The Measurement of attitude! *Ameri. J of Sociol.* Chicago University Press, 39-50.
- Thurstone, L. L. and Chave, E. G. (1928) The measurement of opinion. *Journal of Abnormal Social Psychology*, 22: 415-430.
- Vinaya Kumar Hebsale Mallappa, & Gadde, S. (2026). A multi-dimensional scale for quantifying farmers' adaptation strategies to climate change. *Indian Journal of Extension Education*, 62(2), 156–160. <https://doi.org/10.48165/IJEE.2026.622RT04>
- Vinaya Kumar, H. M., Shivamurthy, M., & Biradar, G. S. (2016). A scale to measure climate-induced crisis management of farmers in Coastal Karnataka (India). *Advances in Life Sciences*, 5(16), 6206–6212.

---

Received : April 2026 : Accepted : May 2026