



## Developing An Attitude Scale on Precision Farming Employing Equal Appearing Interval Technique

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The purpose of this study was to measure the attitude and perception of farmers engaged in precision farming on the concepts and thoughts of Precision farming and identifying effective factors on their attitude. A sample consisting of 200 respondents was selected through Purposive sampling in the study area. Possible statements (89) concerning the psychological object i.e. 'Attitude towards Precision Farming' were collected. They were edited based on Edward's criteria and 79 statements were identified for further analysis. After receiving the opinion of 42 judges for the statements by employing Equal Appearing Interval method nine statements were selected based on the Scale (S) and Interquartile range (Q) values. Further reliability and validity of the scale was assessed and found satisfied. The attitude scale was applied on the farmers engaged in precision farming to measure their attitude towards Precision Farming.

**Key words:** Precision farming, attitude scale, equal appearing interval.

Attitude is an evaluative statement either favourable or unfavourable about objects, people or events. They reflect how we feel about something. Attitudes are the ways in which a person thinks, feels and acts. Attitudes are complex. The components of attitudes viz., Cognitive (beliefs, disbeliefs, opinions), affective (likes, dislikes, feelings), behavioural component (action) makes easy understanding the reasons underlying the responses of human beings. Thurstone and Chave (1929) explained attitude as the degree of positive or negative affect towards some psychological object. The psychological object may be a person, an object, an event, a concept or a technology. Assessing the attitude of the farmers towards precision farming tends to be most important to promote precision farming technologies among farmers. So the attitude scale was constructed for this study using equal appearing interval scaling technique. The procedure adopted to develop the attitude scale is explained in this paper.

### Materials and Methods

#### *Attitude towards Precision farming*

A scale was developed to measure the attitude of farmers engaged in precision farming towards precision farming. The scale was constructed by following 'Equal Appearing Interval' scaling technique developed by Thurstone and Chave (1929). The steps followed in construction of attitude scale are presented below.

#### *Operationalization of attitude of farmers towards precision farming*

For the purpose of this study, attitude was operationalised as the mental disposition of the farmers about precision farming in varying degrees of favourableness or unfavourableness.

#### *Collection of attitude items*

Possible statements concerning the psychological object i.e. 'Attitude towards Precision Farming' with respect to economic benefits, employment opportunities, resource utilization, risk management, commercial orientation etc. were collected based on review of literature, discussion with scientists involved in precision farming project and Extension personnel. Totally 89 statements were collected, organized and structured in the form of items. The items were screened by following the informal criteria suggested by Edwards (1969) for editing the statements to be used in the construction of the attitude scale. Based on the screening, 79 items were finally selected which formed the universe of contents.

#### *Item scoring and computation of scale values and Q values*

The 79 statements were then subjected to judges opinion on a five- point continuum ranging from most unfavourable to most favourable. The list of statements was sent to 48 judges comprised of scientists of State Agricultural Universities and ICAR Research Institutes and Extension personnel of the State Department of Agriculture. Of the 48 judges,

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42 judges responded by sending their judgements. By applying the formula as suggested by Thurstone and Chave (1929), the scale values and Q values were computed for the 79 statements.

#### Scale Value

$$S = I + \{ (0.50 - \Sigma P_b) / P_w \} i$$

Where,

S= the median /Scale value of the statement

I= the lower limit of the interval in which the median falls

$\Sigma P_b$ =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 one(1).

Thurstone and Chave used the interquartile range (Q) as a measure of the variation of the distribution of judgements for a given statement. The interquartile range contains the middle 50% of the judgements. To determine the value of Q, 75<sup>th</sup> and 25<sup>th</sup> centiles should be obtained.

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

$$C_{75} = I + \{ (0.75 - \Sigma P_b) / P_w \} i$$

Where,

$$C_{75} = 75^{\text{th}} \text{ centile}$$

I= the lower limit of the interval in which the 75<sup>th</sup> centile falls

$\Sigma P_b$ =the sum of the proportions below the interval in which the 75<sup>th</sup> centile falls

$P_w$ =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 one(1).

$$C_{25} = I + \{ (0.25 - \Sigma P_b) / P_w \} i$$

Where,

$$C_{25} = 25^{\text{th}} \text{ centile}$$

I= the lower limit of the interval in which the 25<sup>th</sup> centile falls

$\Sigma P_b$ =the sum of the proportions below the interval in which the 25<sup>th</sup> centile falls

$P_w$ =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 one(1).

A large Q value, indicating the disagreement among the judges as to the degree of the attribute possessed by a statement, is therefore taken as an

indication that there is something wrong with the statement. Thurstone and Chave regard large Q values primarily as an indication that a statement is ambiguous. Large Q values may result from the fact that the statement is interpreted in more than one ways by the judges when making their judgements.

#### Selection of attitude items

The attitude items to be included in the final attitude scale were selected based on the following criteria.

- N The statements selected should represent the universe of content with respect to precision farming.
- N The statements selected should adequately represent the domains such as economic benefits, employment opportunities, resource utilization, risk management, commercial orientation etc.
- N The scale values of the selected attitude items should have equal appearing interval i.e. distributed uniformly along the psychological continuum.
- N Those items with high Scale values (S) and smaller Q values should be selected as far as possible.
- N There should be more or less equal number of statements with favourable and unfavourable attitudes as far as possible.

An objective methodology was devised in order to select the attitude items keeping in mind the criteria mentioned. The scale values were arranged in descending order of magnitude and the difference between the successive scale values and the cumulative total of the computed differences were worked out. Considering the time limitation from farmers' point of view, **nine** statements were selected to constitute the attitude scale. Since the selected scale values should have equal appearing interval and distributed uniformly along the psychological continuum, it was necessary to form **nine compartments** so as to select nine statements at one statement from each compartment. The basis for forming the compartments was that, each compartment should be equally spaced in the continuum. For this purpose, the cumulative total was divided by nine, which worked out to **0.546**, and this formed the width of the class intervals. Each class interval represented a compartment for the selection of the attitude items.

To select the attitude items from the nine compartments the scale values (S) and the corresponding Q values were considered. Based on the criteria already mentioned, items having high scale values (S) and low Q values were selected at one item from each compartment. Care was taken to ensure that the selected items represented the

universe of content and covered different aspects of precision farming. Thereby, nine items were selected with equal appearing interval and with a uniform distribution along the psychological continuum.

## Results and Discussion

The final items to measure the attitude selected through Equal Appearing Interval Technique are given in Table 1.

**Table 1. Items selected to measure the attitude of farmers towards Precision Farming**

| S. No. | Scale Value | Q Value | Statement  |
|--------|-------------|---------|--|
| 1.     | 0.125       | 1.380   | Precision Farming encourages cultivation of high value crops.                                  |
| 2.     | 0.500       | -0.166  | Precision Farming has complicated practices to adopt.  |
| 3.     | 1.700       | 1.575   | Precision Farming provides more avenues for income generation.                                 |
| 4.     | 1.785       | 1.456   | Farmers with inadequate finance cannot go for Precision Farming.                               |
| 5.     | 2.300       | 0.966   | Nature of Precision Farming varies according to agro-climatic zones                            |
| 6.     | 2.666       | 0.410   | Precision Farming require regular contact with Agriculture consultants.                        |
| 7.     | 3.500       | 1.250   | Eco-friendly crop management technologies are not recommended in Precision Farming.            |
| 8.     | 3.900       | 0.500   | Practicing Precision farming increase the risk taking ability of the growers.                  |
| 9.     | 4.500       | 3.75    | Precision farming envisages significant improvement in the economic conditions of the farmers. |

After selecting the statements based on Scale value and Q values, the validity and reliability of the scale was assessed as follows

### Reliability of the scale

The reliability of the scale was determined by 'split- half' method. The split- half method is regarded by many as the best of the methods for measuring reliability (Garrett and Woodworth, 1973). The nine selected items to measure the attitude were divided into two equal halves by odd -even method (Singh, 2008). The two halves were administered separately to 30 farmers engaged in precision farming in a non-sample area. The scores were subjected to product moment correlation test in order to find out the reliability of the half-test. The half-test reliability coefficient (r) was 0.570, which was significant at five per cent level of probability. Further, the reliability coefficient of the whole test was computed using the Spearman-Brown

prophecy formula. The whole test reliability (rtt) was 0.726. According to Singh (2008), when the mean scores of the two groups are of narrow range, a reliability coefficient of 0.50 or 0.60 would suffice. Hence, the constructed scale is reliable as the rtt was greater than 0.60.

### Content validity of the scale

It referred to the representativeness or sampling adequacy of the content of a measuring instrument (Kerlinger, 2007). Content validation was carried out by subjecting the selected nine attitude items to judge's opinion. Experts in the selected field of study were the judges. They were asked to indicate the extent to which each attitude item covered the different aspects of precision farming or judge each item for its presumed relevance to the property being measured. The responses were obtained on a four-point continuum of 'most adequately covers', 'more adequately covers', 'less adequately covers' and

**Table 2. Scoring Procedure**

| Nature of the statement | Continuum      |       |           |          |                   |
|-------------------------|----------------|-------|-----------|----------|-------------------|
|                         | Strongly Agree | Agree | Undecided | Disagree | Strongly Disagree |
| Favourable              | 7              | 5     | 4         | 3        | 1                 |
| Unfavourable            | 1              | 3     | 4         | 5        | 7                 |

'least adequately covers'. Scores of 4, 3, 2 and 1 were given for the points on the continuum respectively. Totally 42 judges responded by sending their judgements. The mean score (2.5) was fixed as the basis for deciding the content validity of the scale i.e. if the overall mean score of the attitude items as rated by the judges was above 2.5, the scale will be declared as valid and if not otherwise. In the present case, the overall mean

### Administration of the scale

The nine attitude items selected were arranged randomly in order to avoid biased responses. A five-point continuum of 'strongly agree', 'agree', 'undecided', 'disagree' and 'strongly disagree' was used as response categories. The scoring procedure adopted is presented in Table.2

This scale was administered to obtain precision

score was worked out as 3.0 therefore, the constructed attitude scale is said to be valid.

farmers responses. The score obtained for each statement was summed up to arrive at the attitude

score for that respondent. The score ranged from 63 (maximum) to 9 (minimum). The responses were grouped as less favourable, moderately favourable and highly favourable based on the cumulative frequency method.

### Conclusion

Among the various methods available for the construction of attitude scales, Equal Appearing Interval Scaling technique was employed in the study to measure the Attitude of farmers practising precision farming towards Precision Farming. This technique has been widely applied when the universe of statements are in large. In this study the universe of items was 89, and hence this method was used. Following Edwards Criteria ten statements were deleted and finally 79 statements which satisfied those criteria were selected. The S and Q values for all the 79 statements were computed and nine statements with high scale values (S) and low Q values were selected for inclusion in the final attitude scale to be

administered with the sample. The reliability and the content validity of the nine statements were assessed and found satisfied. These statements can be used in similar situations wherever applicable with necessary modifications if required.

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