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Developing A Unidimensional Scale to Measure Attitude of Extension Officials Towards Advisory Services During COVID-19

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ABSTRACT

The COVID-19 outbreak has generated extreme vulnerability in the agriculture sector. Extension Advisory Service (EAS) systems have been playing a crucial role at the frontline of the response to the COVID-19 pandemic in rural areas. So, it is need of the hour to study extension officials' attitude in delivering advisory services to farmers even during this pandemic situation. The overall objective of the study is to develop a scale to measure extension officials' attitude towards their advisory services during COVID-19. Scale Discrimination Technique (SDT) was followed to develop the attitude scale. The procedure included Thurstone scaling, item analysis and scalogram analysis, and resulted in a largely unidimensional scale with a wide diverseness of item content and range of scores, corrected as far as possible for the operation of response styles, and possessing high reliability. Out of 60 statements, initially 30 statements selected using Thurstone scaling and further analysis done by summated ratings and phi coefficient calculated for those 30 statements and finally the developed scale consists of two forms A and B with 12 statements using Guttman scalogram analysis. The coefficient of reproducibility (Rep) of the two forms (0.856 and 0.956) gives the scale as a whole a Rep of 0.91, which implies that the scale is satisfactorily unidimensional with a standardized measure of reliability and validity. The developed scale used to study the extension officials' attitude towards their advisory services which shows their attitude and it also helps them to strengthen their way of providing advisory services to farmers.

Key words: Scale discrimination technique; Attitude scale; Unidimensionality; Advisory services.

The outbreak of the pandemic COVID-19 restricted normal execution of agricultural extension services and movement of agricultural produce to markets. Direct farmer access to extension services was limited due to travel restrictions and banning of public gatherings. (Prosper Bright *et al*, 2021). Prohibition on public gatherings hindered the provision of adequate agricultural extension services such as farmer trainings, agricultural input distribution, field visits, field schools and district agricultural shows.

Extension and Advisory Service (EAS) systems responded quickly in providing COVID-19 information to rural communities and to adapt their regular outreach to the "new normal" of social distancing and impersonal communication. EAS made critical contributions to minimize COVID-19 impact in raising

awareness about COVID-19 in rural areas, assessing the field situation and advocating urgent solution to farmers' needs, ensuring continuous support to rural producers in a situation of physical distancing, building partnerships to overcome market disruptions and helped in addressing emerging social issues (FAO, 2020).

In many cases extension workers cannot move around and reach out to farmers for agricultural advice. Farmers also on the other hand, couldn't sale their products to buyers after harvest, thus the whole food system is affected by COVID-19 (Workie, E. *et al*, 2020). This COVID-19 made adaptations in EAS delivery mechanisms, it is need of the hour to assess those adaptations, a unidimensional scale is used to study extension officials' attitude in delivering

revamped advisories to farmers. Hence, this research paper aims to develop a scale to measure attitude of extension officials towards their advisory services during COVID-19.

METHODOLOGY

Attitude is an organized predisposition to think, feel, perceive and behave towards a referent or cognitive object (Kerlinger, 1973). Attitude in the present study is defined as "the degree of positive or negative feeling, opinion, belief and action associated with extension officials towards their advisory services in agriculture during COVID-19.

For measuring attitude of extension officials towards their advisory services, a scale has been developed. Possible statements concerning psychological object 'advisory services on par with COVID-19' were prepared by consulting Agricultural extension scientists, agricultural extension officers and through relevant literatures. In total, 60 statements finalized by screening items through Edwards (1969) informal criteria formed the universe of content. The selected items includes both positive and negative statements.

Scale Discrimination Technique (SDT) was used to develop the attitude scale. It is essentially a synthesis of the methods of item evaluation of Thurstone and Chave (1929), Likert (1932) and Guttman (1944). Scale discrimination technique consists of a synthesis of several well-known procedures, and yields a method of attitude scaling which retains all the advantages, and eliminates most of the disadvantages of Thurstone, Likert and Guttman scaling procedures. In particular, Unidimensionality, a wide diversity of item content, and a wide range of scores are guaranteed, the operation of response styles is kept at a minimum, and high discriminating power is assured, thereby giving excellent chances of achieving high validity.

Thurstone Equal Appearing Interval - Obtaining Scale value and Q value : Online survey form consisting of 60 statements was given to 30 subjects with instructions to judge the degree of favourableness and unfavourableness of each statement in terms of nine intervals. Thurstone and Chave (1929) conclude that a relatively small number of judges can be used to obtain reliable scale values for statements using the method of equal-appearing intervals. The judges were then requested to sort the 60 statements into 9 piles, with highly unfavourable attitude towards advisory services

on the left to highly favourable on the right. By obtaining responses from judges, the Scale value and Q value were calculated by applying equal appearing scale Interval formula as suggested by Thurstone and Chave (1929). The S value can be obtained from the following formula:

$$S = l + \frac{(0.5 - \sum P_b)}{P_w} i$$

Where,

S - the 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 proportion 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

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

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

Inter quartile range (Q) value = $C_{75} - C_{25}$

Likert summated ratings : After calculation of Scale value and Q value, median of the Q value for all the statements was determined. From 60 statements, 30 statements displaying highest Q values (above median Q value) were eliminated that shows the greatest degree of spread of judgments on the psychological continuum and the remaining 30 statements were retained for Likert scaling. These statements were typed in the form of an inventory with six response categories: "strongly disagree", "disagree", "mildly disagree", "mildly agree", "agree" and "strongly agree". Here the response categories were weighted 0 through 5, such that 5 always indicated the response 'most favourable' towards their advisory services and 0 indicates highly unfavourable attitude. That is, for favourable statements, the response of 'Strongly Agree' is scored 5; 'Agree' gets 4; 'Mildly Agree' gets 3; 'Mildly Disagree' gets 2 and 'Disagree' gets 1 and 'Strongly Disagree' gets the least score of 0. On the other hand, for the unfavourable statements the scoring pattern is reversed such that the response of 'Strongly Disagree' is given a score of 5 and so on.

The appropriate direction of the weighting was determined by the position of the statements on the Thurstone continuum. The resulting summated rating

scale distributed to a new group of 30 subjects to indicate their own agreement and disagreement. For each subject, a total score is obtained based upon his responses to all statements.

Item analysis : Obtained subjects score are arranged in descending order. A criterion followed for item analysis is to select top 27 per cent (High group) and bottom 27 per cent (Low group) of total subject's score. The purpose of item analysis is to select items which can able to discriminate very well between two criterions (Pordhiya et al, 2022)

Dichotomizing response categories : The six response categories of Likert scale were then dichotomized by means of scalogram analysis. The thumb rule followed to dichotomize response categories is to minimize the total number of subjects in the low group above the line and maximize the number of subjects in the high group below the line. Based on the rule, the response categories were dichotomized for all 30 statements. New weights of 0 and 1 were assigned to each statement after dichotomy.

Finding the discriminating power of the statements : After dichotomizing response categories, for each statement a coefficient is required to represent the extent to which a statement can discriminate the high and low groups. For the purpose, Phi coefficient can be calculated by using the formula;

$$r\phi = \frac{bc - ad}{\sqrt{(a+b)(b+d)(a+c)(c+d)}}$$

Selection of statements : Once phi coefficient was obtained for each statement, then the statements were plotted in new two-way table with Thurstone scale value on x axis and phi coefficient on y axis. Based on cumulative scale difference, nine interval Thurstone continuum has been divided into three-scale intervals. From each interval, four statements were selected with highest phi coefficient (>0.4 $r\phi$ value), so that they are distributed throughout the continuum. Two forms of the scale (A and B) were then prepared by assigning items to either form alternately in order of their scale values.

Guttman scalogram analysis : These derived two forms of scale (A and B) again given to new group of 30 subjects. Here subjects were instructed to indicate their own agreement and disagreement in terms of original six response categories. Obtained responses were rescored using dichotomized response categories with weights of 0 and 1. By applying scalogram

analysis suggested by Goodenough (1944) to each form separately, coefficient of reproducibility and range of modal response categories were calculated. The coefficient of reproducibility can be calculated from the following formulae,

$$\text{Coefficient of reproducibility} = 1 - \frac{\sum e}{n * c}$$

Where, n = number of respondents

C = number of statements

$\sum e$ = Summation of error

The two equivalent forms of the resulting scale are given in Table 2. A line is drawn under the response category or set of response categories for each statement which is scored 1. All other responses are scored 0. The underlining should be omitted when testing subjects.

RESULTS AND DISCUSSION

From the online survey (Google form), out of total 60 statements, 30 statements (50%) eliminated through equal appearing interval method based on highest Q value. The exclusion of statements with highest Q value ensures that the items in the scale are all relatively unambiguous. Here, the median Q value calculated was 2.02. Hence, the statements with Q value more than 2.02 were excluded and the remaining statements with highest S value and lowest Q value alone selected for summated ratings.

Then summated analysis was carried out for 30 statements with six response categories (Strongly Disagree, Disagree, Mildly Disagree, Mildly Agree, Agree, Strongly Agree). These 30 statements again given to new group of 30 subjects. From the obtained responses through summated analysis, response categories were dichotomized using thumb rule. Then, high group (top 27%) and low group (bottom 27%) distribution obtained through item analysis. As basis for rejecting of statements, the method of summated ratings was used (Patel and Sharma, 2022). To find out discriminating power of the statements, phi coefficient was calculated for each statement.

Once phi coefficient values were obtained for each statement, then the statements are plotted in two-way table (shown in Fig.1) in which Thurstone scale value are on the horizontal axis and the values of phi coefficient on the vertical axis. It has been divided into three intervals based on cumulative scale difference and from each interval 4 statements selected with

Table 1. Statements selected through Thurstone equal appearing interval analysis

Statements	S value	Q value
Increased difficulty in providing skill trainings during COVID-19	4.75	1.91
Restricted movement of agricultural officers to meet farmers during COVID-19	4.84	1.87
It is very hard to gather farmers for online meeting during COVID-19.	4.90	2.02
Increased difficulty in disseminating information to farmers during COVID-19	4.96	1.7
Extension advisories acts as emergency responses to adapt to the economic shocks of COVID-19	5.00	1.98
Increased difficulty in disseminating information to farmers during COVID-19	5.00	1.88
Social media is the most preferred means of communication during COVID-19.	5.10	1.59
Collective solution for the farmers problem decreased during COVID-19	5.20	1.59
Extension advisories increased in the aspect of marking during COVID-19	5.23	1.88
Conducting online trainings to farmers during COVID-19 was difficult	5.28	1.67
Delivering advisories becomes easier during COVID-19	5.34	1.91
Continuous advisory services of extension officials interrupted during COVID-19	5.50	1.37
Advisories through online is the only alternate way during COVID-19	5.50	1.33
Increased use of online platforms by farmers during COVID-19	5.59	1.14
Extension officials neglected advisories of minor agricultural activities during COVID-19	5.61	1.70
Extension official's role increased in creating awareness regarding COVID-19	5.61	1.67
Farmers' response to officers' phone calls increased during COVID-19	5.63	2.01
Occasional field visit of extension officials during COVID-19 leads to intermittent monitoring of crop performance	5.77	1.25
Increased difficulty in identifying convenient extension methods during COVID-19	5.83	1.72
Reach of extension advisories to farmers delayed during COVID-19	5.86	1.54
Farmers' frequency of visit to state department slows down during COVID-19	5.86	1.56
Decreased level of face-to-face trainings, meetings and demonstrations during COVID-19	5.90	1.81
Increased difficulty in transferring new technologies to farmers during COVID-19	6.00	1.40
Increased difficulty in enrolling farmers to new agricultural schemes during COVID-19	6.10	1.52
Extension official's role increased in motivating farmers with regard to COVID-19	6.14	1.65
Public – Private combination leads to excellent advisory deliveries during COVID-19	6.37	1.19
COVID-19 reduces the role of extension officials in farmers' decision making	6.37	1.69
Farmers subject to lot of stress and financial instability due to COVID-19	6.56	1.4
Increased use of online platforms by farmers during COVID-19	6.56	1.72
COVID-19 persuades extension officials to use print and Radio intensively	6.71	1.56

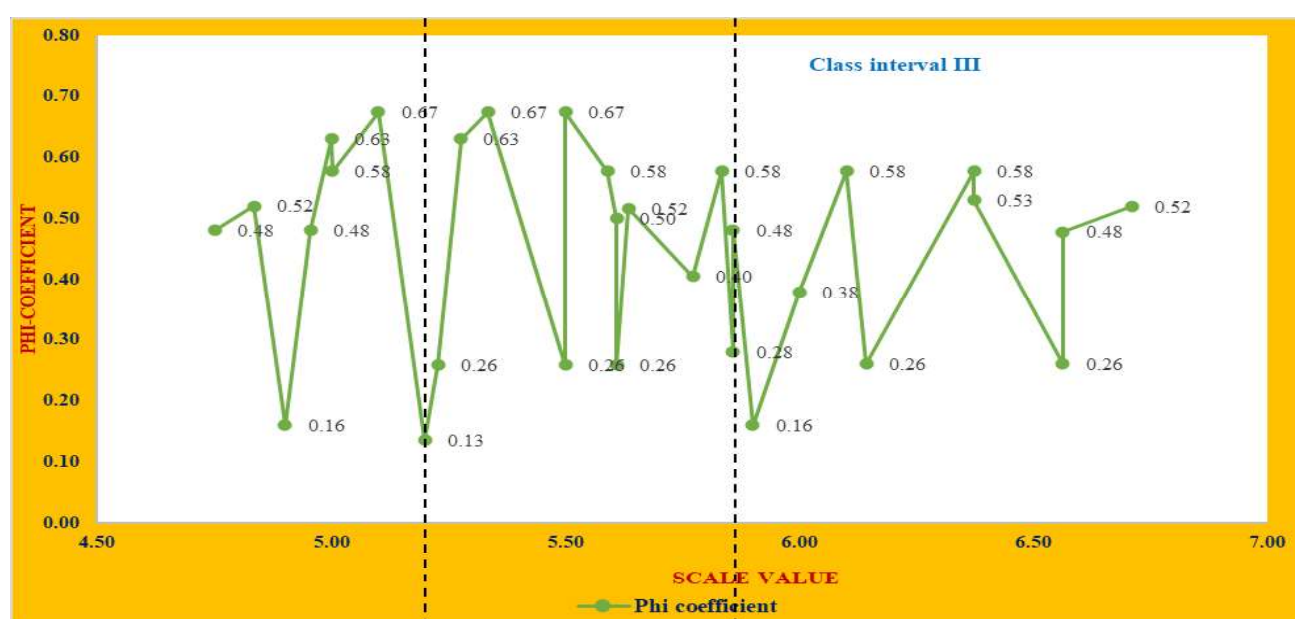
**Fig.1 Two-way table showing Thurstone scale value and phi coefficient value**

Table 2. The attitude of extension officials towards advisory services in agriculture during COVID-19

<i>Form A</i>						
Restricted movement of Agricultural Officers to meet farmers during COVID-19	<u>SD</u>	<u>D</u>	<u>MD</u>	<u>MA</u>	A	SA
Increased difficulty in disseminating information to farmers during COVID-19	<u>SD</u>	<u>D</u>	<u>MD</u>	<u>MA</u>	A	SA
Conducting online trainings to farmers during COVID-19 was difficult	<u>SD</u>	<u>D</u>	<u>MD</u>	<u>MA</u>	A	SA
Continuous advisory services of extension officials interrupted during COVID-19	<u>SD</u>	<u>D</u>	<u>MD</u>	<u>MA</u>	A	SA
Increased difficulty in enrolling farmers to new agricultural schemes during COVID-19	<u>SD</u>	<u>D</u>	<u>MD</u>	<u>MA</u>	A	SA
COVID-19 reduces extension officials' role in farmers' decision making	<u>SD</u>	<u>D</u>	<u>MD</u>	<u>MA</u>	A	SA
<i>Form B</i>						
Extension advisories acts as emergency responses to adapt to the economic shocks of COVID-19	SD	D	MD	MA	<u>A</u>	<u>SA</u>
Social media is the most preferred means of communication during COVID-19	SD	D	MD	MA	<u>A</u>	<u>SA</u>
Delivering advisories becomes easier during COVID-19	SD	D	MD	<u>MA</u>	<u>A</u>	<u>SA</u>
Farmers response to officers' phone calls increased during COVID-19	SD	D	MD	MA	<u>A</u>	<u>SA</u>
Public-private combination leads to excellent advisory deliveries during COVID-19	SD	D	<u>MD</u>	<u>MA</u>	<u>A</u>	<u>SA</u>
COVID-19 persuades extension officials to use print and Radio intensively.	SD	D	<u>MD</u>	<u>MA</u>	<u>A</u>	<u>SA</u>

**Fig 2. Bar charts showing the Predicted Response Pattern (PRP) of Table. 2 for Scalability analysis**

highest phi coefficient value ($>0.4 \phi$) and finally 12 statements selected for developing a scale.

The developed scale consists of 12 statements i.e. two equivalent forms containing 6 items each. The response to each item is scored 1 or 0, giving the scale as a whole a range of scores from 0 to 12.

Guttman Scalogram analysis using Goodenough method

The items are drawn from widely distinct points on the Thurstone continuum; therefore, they represent both favourable and unfavourable opinions concerning Advisory services. This ensures that consent response style is kept at minimum and that the scale does not consist of simple rephrasing's of the same opinion. Extreme response style, "ambiguousness" and "criticality" are probably minimised by the use of six forcing response categories which do not include a "neutral" category (Colman, 1971).

The mean of modal response categories in this scale is 0.68 (the range is 0.33 to 1.00 for both form A and form B). The coefficient of reproducibility of the two forms (0.856 and 0.956) gives the scale as a whole a Rep of 0.91, which implies that the scale is satisfactorily unidimensional. If a coefficient of reproducibility of 0.90 or greater is obtained with any of the successive score matrices, this constitutes evidence for the scalability of the set of statements (Guttman, 1944).

Reliability and validity of attitude scale : The scale developed was further standardized by establishing its reliability and validity. "Reliability is the accuracy or precision of measuring instrument". To know the reliability of the attitude scale Split-Half method is followed. As Validity literally means truthfulness, which refers to "the degree to which a test measures, what it claims to measure", content validity is used to measure the validity of the scale.

Split-half methodology : The reliability of the scale was determined by 'split half' method. The twelve selected attitude items were divided into two equal halves by odd even method. The two halves were administered separately to 30 respondents 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 by using SPSS software. The half-test reliability coefficient (r) was 0.875 which was significant at one 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 0.78. When the purpose of the test is to compare the mean scores of two groups of narrow range a reliability coefficient of 0.50 or 0.60 would suffice (Singh, 1986). Hence, the constructed scale is reliable, as the reliability coefficient (rtt) was >0.60

Content validity : Content validation was carried out by subjecting the selected twelve items to judge's opinion. The judges were requested to indicate their presumed relevance to which the attitude items covered different aspects of extension officials' advisory services. The responses were obtained on a four-point continuum of 'most adequately covered', 'more adequately covered', 'less adequately covered' and 'least adequately covered'. Scores of 4, 3, 2 and 1 were given for the points on the continuum respectively. 30 expert's opinion was obtained from their judgements. The mean score of 2.5 was fixed as the basis for deciding the content validity of the scale. 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 score was worked out as 3.28 and therefore the constructed attitude scale is said to be valid.

CONCLUSION

This COVID-19 is a tough time not only for extension officials and also for the people all over the world. But there is a demand here, for extension officials to execute their work even during this COVID-19 pandemic because the other side of receiving their advisories were farmers. Even the whole world is in curfew, farmers continuously involved in crop production activities and COVID-19 had affected farmers tremendously. In order to support, motivate farmers and also to tackle this unpleasant situation, extension officials' advisory services are the need of the hour. Though there is a restricted movement for extension officials to meet group of farmers, they found some alternatives to disseminate agricultural advisories. These advisories act as emergency responses for farmers to adapt to the economic shocks of COVID-19. The developed scale containing 12 statements will measure extension official's attitude towards their advisory services even during COVID-19 pandemic. By measuring extension officials' attitude through this scale will divulge their feelings of alternatives utilized for delivering advisories during COVID-19 and it further ensures other alternative ways to improvise their advisory

deliveries in a better way. Hence the developed scale possessing high discriminating power and validity, it is a unidimensional one. Researchers can make use of the scale for measuring attitude of extension officials

in similar studies.

CONFLICTS OF INTEREST

The authors have no conflicts of interest.

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