RESEARCH **A**RTICLE :

Scale to measure attitude of the farmers towards greenhouse technology (GT)

■ S. SMITHA, V. SREERAM, V. T. ONIMA AND KRUNAL GULKARI

SUMMARY : A scale was developed to measure the attitude of the farmers towards greenhouse technology based on "Scale Product Method" which combines the Thurston's technique of Equal Appearing Interval Scale for selection of the items and Likert's techniques of summated rating for ascertaining the response on the scale. A tentative list of 33 statements was drafted keeping in view the applicability of statements suited to the area of study. The statements collected were edited in the light of the criteria suggested by Edward. These statements were framed in such a way that they expressed the positive or negative attitude of the farmers. The score of each individual item on the scale was calculated by summing up the weights of the individual items. Scale and Q value was calculated by using Thurstone and Chave inter-quartile range. Finally the scale consisted of 12 statements whose median (scale) values were greater than Q values. However, when a few statements had the same scale values, statements having lowest Q value were selected by arranging the scale value in an order. Reliability was tested with 20 respondents and its value was 0.77 and validity of the scale was examined.

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BACKGROUND **AND** **O**BJECTIVES

Attitude has been defined as "the degree of positive or negative feeling, affect, opinion, action and belief associated with some psychological object". Psychological object may be any symbol, institution, person, phrase, slogan, idea or ideal towards which people may differ from each other with respect to positive or negative aspect. The cognitive component of an attitude consists of the beliefs, which involves attributes like favorable or unfavorable, desirable or undesirable, good or bad etc. The feeling component refers to the emotions which give attitude a motivating character or action tendencies. The action tendency component of an attitude includes all behavioral readiness associated with it. These three components of attitude, are, however, consistently related to each other. The psychological object for the present study has been conceptualized as the advantages of greenhouse technology(GT).

RESOURCES **AND** **M**ETHODS

Among the techniques available for the construction of the scales, the Thurstone's

Equal Appearing Interval Scale (1928) and the Likert's Summated Rating Scale (1932) are quite well known. Both the methods suffer from the limitations, the first one in getting discriminating response and second one in the selection of items. Thus, the technique chosen to construct the attitude scale was of "Scale Product Method" which combines the Thurstone's technique of equal appearing interval scale for selection of the items and Likert's technique of summated rating for ascertaining the response on the scale as proposed by Eysenck and Crown (1949).

Steps in development of attitude scale :
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 the developing the attitude scale towards GT, a number of statements about GT were assembled from the relevant literature, horticulturist, researchers, extension personals and officials of horticulture department who were directly or indirectly exposed to such knowledge system. In all 54 statements were collected at first stage. The statements, thus selected were edited according criteria laid down by Edward (1957) and finally retained 32 statements (Table A).

Judges rating of attitude statements :
In order to judge the degree of "unfavorableness" to "favorableness" of each statement on the five point

No.	Statement	Scale value	Q value	Decision
	Table A : Method of selecting the statements for the scale based on scale value and inter quartile range			
1	I believe that Greenhouse Technology (GT) helps to produce quality crop production. (+)	1.33	1.00	Selected
19	I am sure that GT is a profitable venture. (+)	1.39	1.28	Selected
18	Adoption of GT helps in increasing fertilizer use efficiency. (+)	1.50	1.16	Rejected
30	I believe that GT helps to get maximum benefits from a small piece of land. (+)	1.54	1.06	Selected
2	I feel that GT helps to get higher crop production. (+)	1.67	1.09	Rejected
31	I feel that GT provides year round income. (+)	1.69	1.02	Selected
28	I think GT helps in increasing country's agricultural productions as it allows year round production (+)	1.71	1.10	Rejected
26	I think that GT is not propaganda but really result oriented one. (+)	1.75	1.00	Rejected
3	I like to adopt GT because it helps in generating high agricultural return (+)	1.83	0.92	Selected
12	I think that GT means less infestation of pest. (+)	1.98	1.47	Rejected
27	I believe that GT helps to make efficient use of unproductive land(+)	2.00	1.12	Rejected
32	I realize that GT is a boon for farmers of rainfed areas. (+)	2.02	1.23	Rejected
16	I think that GT is possible to adopt even for average farmers. (+)	2.09	1.12	Selected
11	I welcome GT as application of chemicals to solve pest problem is easier(+)	2.18	1.72	Rejected
17	Adoption of GT helps in minimizing soil erosion. (+)	2.18	1.50	Rejected
13	I feel that GT is difficult to adopt because it requires costly inputs. (-)	2.20	2.22	Rejected
6	I favour GT as it reduces labour cost. (+)	2.63	2.18	Selected
24	I believe that GT is worth to adopt though it is laborious(-)	3.05	2.04	Selected
8	I believe that GT is unfeasible for small farmers. (-)	3.10	2.45	Rejected
23	I don't like to go for GT due to big investment at initial stage of establishment (-)	3.28	2.27	Rejected
5	I feel that GT is complicated to adopt. (-)	3.50	2.24	Rejected
10	I consider that GT is only possible for rich farmers.	3.50	2.18	Selected
14	I believe that adoption of GT means inviting big risk. (-)	3.50	2.33	Rejected
25	I think adoption of GT is only possible for taking government financial support (-)	3.56	2.29	Rejected
20	I feel that GT is like a gambling. (-)	3.58	2.43	Rejected
9	I believe that GT is unviable for illiterate farmers. (-)	3.61	1.63	Selected
29	I think GT is difficult to adopt because its operations are tedious (-)	3.79	1.29	Selected
4	I am not in favour of advising anyone to practice GT in agriculture. (-)	3.79	2.17	Rejected
15	I believe that GT is not adoptable for longer period. (-)	3.91	1.56	Rejected
7	I feel that GT is complicated so it is impractical to adopt (-)	3.98	1.08	Selected
21	Investment on GT in agriculture production is wastage of money. (-)	4.13	1.56	Rejected
22	I feel that GT means invitation to the imbalance ecology (-)	4.11	1.52	Rejected

equal appearing interval continuum a panel of 50 judges was selected. The judges selected for the study comprised of extension educationist, horticulturist and statistician with considerable practical experience in horticulture from the Anand Agricultural University and officials of horticulture department, Anand. The judges were visited personally along with letter of instructions to guide them for rating the statements in desired manner for each set of the statements.

Determination of scale and quartile value :

The five points of the rating scale were assigned, ranging from 1 for most unfavourable and 5 for most favourable. On the base of judgment, the median value of the distribution and the Q value for the statement concerned was calculated, the inter-quartile range for each statement was also worked out for determination of ambiguity involved in the statement from the following formulas.

$$S \text{ N } L < \frac{0.50 > \quad Pb}{Pw} xi$$

where,

S = Median or Scale value of statement

L = Lower limit of the interval in which the 50th centile falls

ΣPb = Sum of the proportion below the interval in which the 50th centile falls

P_w = Proportion within the interval in which the 50th centile falls

i = Width of the interval, which was assumed as equal to 1.0

Thurstone and Chave (1928) (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 following formula:

$$C_{25} \text{ N } L < \frac{0.25 > \quad Pb}{Pw} xi$$

where,

S = Median or Scale value of statement

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

ΣPb = Sum of the proportion below the interval in which the 25th centile falls

P_w = Proportion within the interval in which the 25th centile falls

i = Width of the interval, which was assumed as equal to 1.0 .

$$C_{75} \text{ N } L < \frac{0.75 > \quad Pb}{Pw} xi$$

where,

S = Median or Scale value of statement

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

ΣPb = Sum of the proportion below the interval in which the 75th centile falls

P_w = Proportion within the interval in which the 75th centile falls

i = Width of the interval, which was assumed as equal to 1.0

Then the interquartile range or Q value was obtained by taking the difference between C_{75} and C_{25} thus,

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

Final statements for attitude scale :

When there was a good agreement among the

No	Statements	SA	A	UD	DA	SDA
	Table B: Final statements of the scale to measure attitude of farmers towards GT					
1.	I am sure that GT is a profitable venture. (+)					
2.	I feel that GT is complicated so it is impractical to adopt.(-)					
3.	I believe that GT is worth to adopt though it is laborious.(-)					
4.	I believe that GT is unviable for illiterate farmers.(-)					
5.	I favor GT as it reduces labour cost.(+)					
6.	I consider that GT is only possible for rich farmers.(-)					
7.	I think that GT is possible to adopt even for average farmers.(+)					
8.	I think GT is difficult to adopt because its operations are tedious.(-)					
9.	I feel that GT provides year round income.(+)					
10.	I like to adopt GT because it helps in generating high agricultural return.(+)					
11.	I believe that GT helps to get maximum benefits from a small piece of land.(+)					
12.	I believe that GT helps to produce quality crop production.(+)					

SA = Strongly agree   A = Agree   UD = Undecided   DA = Disagree   SDA = Strongly disagree

judges, in judging the degree of agreement or disagreement of a statement, Q was smaller compared to the value obtained, when there was relatively little agreement among the judges it was reverse. Only those items were selected whose median (scale) values were greater than Q values. However, when a few items had the same scale values, items having lowest Q value were selected (Thurstone, 1946). Based on the median and Q values 12 statements were finally selected to constitute attitude scale (Table B). The scale values were ranging from 1.33 to 4.11 with 0.5 class intervals.

Reliability of the scale :

A scale is reliable when it consistently produces the same result when applied to the same sample. In the present study, split-half method of testing reliability was used. The 12 statements were divided into two halves with six odd numbered in one half and other six even numbered statements in the other. These were administered to 20 respondents. Each of the two sets of the statements was treated as a separate scale and then these two sub-scales were correlated (Table C). The co-efficient of reliability was calculated by the Rulon's formula (Guilford, 1954), which came to 0.77.

Content validity of the scale :

Validity of the scale examined for content validity by determining how well content were selected by discussion with specialist, extension academicians, etc. thus, the present scale satisfied the content validity.

Scoring system :

The selected 12 statements for the final format of the attitude scale are randomly arranged to avoid response biases, which might contribute to low reliability and detraction from validity of the scale. The

Table C : Reliability of the scale						
Respondents	Score of odd statements X_o	Score of even statements X_e	d ($X_o - X_e$)	d^2	t ($X_o + X_e$)	t^2
1	26	25	1	1	51	2601
2	24	23	1	1	47	2209
3	26	24	2	4	50	2500
4	27	24	3	9	51	2601
5	26	25	1	1	51	2601
6	27	27	0	0	54	2916
7	26	24	2	4	50	2500
8	27	26	1	1	53	2809
9	28	27	1	1	55	3025
10	24	26	-2	4	50	2500
11	25	24	1	1	49	2401
12	25	23	2	4	48	2304
13	27	27	0	0	54	2916
14	28	27	1	1	55	3025
15	25	23	2	4	48	2304
16	27	26	1	1	53	2809
17	23	25	-2	4	48	2304
18	27	27	0	0	54	2916
19	25	24	1	1	49	2401
20	27	26	1	1	53	2809
Total	520	503	17	43	1023	52451

responses can be collected on five point continuums *viz.*, strongly agree, agree, undecided, disagree and strongly disagree with respective weights of 5, 4, 3, 2, and 1 for the favorable statements and with the respective weights of 1, 2, 3, 4, and 5 for the unfavorable statements.

Rulon's formula :

$$r_{tt} = 1 - \frac{\sigma^2_d}{\sigma^2_t}$$

where,

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

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

Calculation :

$\Sigma d = 17$

$\Sigma d^2 = 43$

$t = 1023$

$\Sigma t^2 = 52451$

$n = 20$

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

$$= \frac{43 - \frac{289}{20}}{20}$$

$$= \frac{43 - 14.45}{20}$$

$$= \frac{28.55}{20}$$

$$= 1.4275$$

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

$$= \frac{52451 - \frac{(1023)^2}{20}}{20}$$

$$= \frac{52647 - \frac{1046529}{20}}{20}$$

$$= \frac{52451 - 52326.45}{20}$$

$$= \frac{124.55}{20}$$

$$= 6.2275$$

$$r_{rt} = 1 - \frac{\sigma^2_d}{\sigma^2_t}$$

$$= 1 - \frac{1.4275}{6.2275}$$

$$= 1 - 0.2292$$

$$= 0.77077$$

OBSERVATIONS AND ANALYSIS

In this study, attitude of farmers towards greenhouse technology was measured by administrating the attitude scale that was specially constructed for this purpose. Attitude score of each respondent was calculated by adding up the scores obtained by him/her on all the items. Minimum and maximum possible scores of attitude scale were 16 and 80, respectively. Higher scores indicated that respondent had more consciousness towards greenhouse technology aspect and *vice-versa*. Final format of the scale is given in Table B. Hence, attitude scale was found to be a standardized and an objective one, as indicated by the validity, reliability and norms of distribution of scores. Therefore, this scale can be used by all persons and organizations to measure the attitude of farmers towards greenhouse technology in an objective way.

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