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Development of scale to measure the perception of banana growers about good agricultural practices (GAPs)

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Abstract
The present study had been undertaken to measure the perception of Banana Growers about Good Agricultural Practices (GAPs). For this study 37 statements were selected and the sample of the study comprised of seventy agricultural scientists drawn from different institutes. The researcher selected 'Scale product method' which combines the Thurston's technique (1928) of equal appearing interval scale for selection of items and Likert's technique (1932) of summated rating for ascertaining the response on the scale as proposed by Eysenck and Crown (1949). Only those statements were selected whose 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. Based on the median and Q values, 17 statements from the original list were finally selected to constitute perception scale. The scale values ranged from 1.21 to 3.98 with 0.5 class interval. The present study represented a scale to measure perception of banana growers about Good Agricultural Practices (GAPs). Final version of the scale is ready to use by the academician, researchers or policy makers.

Keywords: scale, measure, perception, banana growers and good agricultural practices

Introduction
Considering the scope and opportunity in the world market, there is a need to give importance to quality assurance of banana fruits. So also, for standing firmly in the world market, there is a need to keep quality, hygienic conditions and standard residue control, so that the fruits qualify all analytical tests. Understanding perception level of the banana growers about GAP will help in understanding their behaviour towards these practices. Perception is the immediate apprehension of an object or all of the sense organs by way of sensation. What we perceive depends more upon the past experience. Thus, perception is a mental phenomenon which depends upon various types of sensation and ideals, which become associated as a whole. Perception cannot observe directly in behaviour, but must be inferred from performance and particularly from the change in performance or behaviour. Promotion of the export of banana would help to earn valuable foreign exchange for the country, in addition to realize higher returns for the banana growers. In this Context, it was felt very relevant to develop the scale of perception of banana growers about Good Agricultural Practices.

Methodology
A special Perception Scale was developed, standardized and employed in the study to measure this variable. The researcher selected 'Scale product method' which combines the Thurstone's technique (1928) of equal appearing interval scale for selection of items and Likert's technique (1932) of summated rating for ascertaining the response on the scale as proposed by Eysenck and Crown (1949).

1. Item collection
The items of perception scale are called as statements. In initial stage of developing the scale, 70 statements reflecting feelings of the farmers towards the GAPs in banana cultivation were collected from relevant literature and discussion with the experts and extension personnels. The collected statements were edited according to the criteria laid down by Edward (1957) and Wang (1932). Accordingly, 37 unambiguous and non-factual statements were selected.

2. Item analysis

In order to judge the opinion for each statement on the five point equal appearing interval continuum, a panel of judges was selected. Hundred slips of the selected 37 statements were handed over to the experts working in Extension Education Institute, Anand, Departments of Extension Education, Directorates of Extension Education and Departments of Horticulture of the SAUs in the country. The judges were requested (Appendix-I) to judge each statement in terms of in terms of its relevancy on five point continuum namely, 'Most Relevant', 'Relevant', 'Undecided', 'Somewhat Relevant' and 'Not Relevant'. Out of these experts, only 70 experts returned the statements after duly recording their judgments and were considered for the analysis.

Result and Discussion

Determination of scale and 'Q' values

The data from the seventy judges were arranged in the form as shown in Table 1. The table shows, as an example, the frequency distribution of judgments made by the judges for the statement number 28 on five point continuum.

Table 1: Frequency distribution of judgment made by judges on five point continuum for Statement No. 28

No.	Category	Frequency of responses	
1	Most Relevant	IIII ~~IIII~~ ~~IIII~~	18
2	Relevant	~~IIII~~ ~~IIII~~ ~~IIII~~ IIII ~~IIII~~ IIII ~~IIII~~ I	36
3	Undecided	~~IIII~~ IIII I	11
4	Somewhat Relevant	II	02
5	Not Relevant	III	03
Total			70

As shown in the Table 1, three rows were used for each statement. The first row gives the frequency (f) with which the statement was placed in each of the five categories. The second row gives these frequencies as proportions (p). The proportions are obtained by dividing each frequency by n *i.e.* the total number of the judges (here it is 70). The third row gives the cumulative proportions (Cp), that is, the proportion of the judgments in a given category plus the sum of all the proportions below the categories.

Table 2: Summary of judgments made by judges on five point continuum for Statement No. 28.

Statement No. 28	Sorting categories					Scale value	Q value
	1	2	3	4	5		
F	18	36	11	2	3	1.97	1.00
P (P_w)	0.26	0.51	0.16	0.03	0.04		
Cp ($\sum P_b$)	0.26	0.77	0.93	0.96	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 Table 2 by means of the following formula.

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

Where,

C_{50}= the median or scale value of the statement

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

P_b= the sum of the proportion below the interval in which the 50th centile falls

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

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

Substituting the values in the above formula to find out the scale value for the statement number 28 in Table 2, we have

$$S = 1.5 + \frac{0.50-0.26}{0.51} \times 1 = 1.97$$

(The interval represented by the number assigned to the given category is assumed to range from 0.50 of a unit below to 0.50 of a unit above the assigned number. Thus, lower limit of the interval represented by the category assigned the number 2 is 1.5 and the upper limit is 2.5. 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 points were measured, the 75th centile and 25th centile. The 25th 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 25th centile falls

P_b= the sum of the proportion below the interval in which the 25th centile falls

P_w= 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).

For the statement number 28 in Table 4, we have $C_{25} = L + \frac{0.25-\sum Pb}{Pw} \times i$

$$C_{25} = 0.5 + \frac{0.25 - 0}{0.26} \times 1$$

$C_{25} = 0.5 + 0.96$

$C_{25} = 1.46$

The 75th 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 75th centile falls

P_b=the sum of the proportion below the interval in which the 75th centile falls

P_w = 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).

For the statement number 28 in Table 2, we have

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

$$C_{75} = 1.5 + \frac{0.75 - 0.26}{0.51} \times 1$$

$C_{75} = 1.5 + 0.96$

$C_{75} = 2.46$

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

$Q = 2.46 - 1.46$

$Q = 1.00$

In this manner, the inter quartile 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 28, S =1.97 and Q = 1.00, hence the statement number twenty eight was selected.

Table 3: Selection of the statements for the perception scale based on scale value and inter quartile range

No.	Statements / Items	S Value	Q Value	Remark
1	Good Agricultural Practices (GAPs) are profitable for agri-business. (+)	1.21	0.83	Selected
2	GAPs help to raise standard of living of the farmers. (+)	1.70	0.93	Selected
3	GAPs give nutritional and hygienic value to the agricultural produce. (+)	1.70	1.14	Rejected
4	GAPs require use of high cost external inputs. (-)	2.40	1.76	Rejected
5	GAPs are easy to adopt. (+)	2.04	0.85	Rejected
6	Produce certified under GAPs fetches higher rates in market. (+)	1.60	1.19	Rejected
7	The GAPs are difficult to understand. (-)	3.14	2.18	Rejected
8	Production through GAPs is expensive. (-)	2.88	2.06	Selected
9	The Government's support for promotion of GAPs is inadequate. (-)	2.40	2.15	Rejected
10	GAPs are more eco-friendly than the recommended practices of crop cultivation. (+)	1.80	0.96	Rejected
11	Environmental pollution and health hazards are reduced due to GAPs. (+)	1.80	1.14	Rejected
12	Adoption of GAPs increases dependency of farmers on consultants.(-)	2.93	1.95	Selected
13	Farmers lose their autonomy due to adoption of GAPs. (-)	3.46	1.55	Selected
14	GAPs facilitate production of export quality farm produce. (+)	1.57	1.08	Selected
15	Adoption of GAPs does not assure marketing of produce in export market. (-)	3.14	2.29	Rejected
16	Practicing GAPs is a waste of capital and time. (-)	3.98	1.74	Selected
17	Adoption of GAPs helps in developing domestic agricultural markets. (+)	2.04	0.84	Selected
18	GAPs work equally well on all kind of farms. (+)	2.04	0.89	Rejected
19	GAPs improve the soil health. (+)	1.60	1.08	Selected
20	Adoption of GAPs is a must to stay in global market. (+)	1.70	1.32	Rejected
21	GAPs help in making money by exporting the produce. (+)	1.70	1.05	Rejected
22	GAPs help reduce the cost of cultivation of the crops. (+)	2.04	1.18	Rejected
23	The procedure of getting GLOBAL G.A.P certification is very difficult. (-)	2.40	1.85	Rejected
24	Procedure for GLOBAL G.A.P certification is time consuming. (-)	2.40	1.46	Selected
25	Procedure for GLOBAL G.A.P certification is beyond the reach of a common farmer. (-)	2.37	2.06	Selected
26	GLOBAL G.A.P certification is available only to the big farmers. (-)	3.50	2.15	Selected
27	GAPs cannot be used by the illiterate farmers. (-)	2.93	2.03	Rejected
28	Farmers having GLOBAL G.A.P certification gain respect in the society. (+)	1.97	1.00	Selected
29	One should feel proud of having GLOBAL G.A.P certification. (+)	1.80	0.84	Selected
30	Information about GLOBAL G.A.P certification is not available at local level. (-)	2.40	2.22	Rejected
31	Overall empowerment of farmers is possible due to GLOBAL G.A.P certification. (+)	2.04	0.89	Rejected
32	GAPs certification standards, norms and regulations are very clumsy. (-)	2.63	1.69	Selected
33	GAPs certification is one of the best means for promoting export of farm produce. (+)	1.70	0.99	Rejected
34	GAPs improve the efficiency in farm management. (+)	1.70	0.94	Rejected
35	GAPs increase the cost of plant protection measures. (-)	3.14	1.76	Selected
36	GLOBAL G.A.P certification has a bright future in India. (+)	1.60	1.21	Rejected
37	GLOBAL G.A.P certification procedure is biased one. (-)	3.29	1.84	Selected

Thurstone and Chave (Edwards, 1957) described another criteria in addition to Q as a basis for rejecting statement in scales constructed by the method of the equal appearing interval. Accordingly, when a few statements had the same scale values, the statement having lowest Q values were selected. To understand this procedure, the statements for the scale in Table 3 can be examined.

Final statements for perception scale

When there was a good agreement among the judges, in judging the degree of agreement or disagreement of a statement, Q was smaller as compared to the scale value obtained. Thus, only those statements were selected whose 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. Based on the median and Q values, 17 statements numbering 1, 2, 8, 12, 13, 14, 16, 17, 19, 24, 25, 26, 28, 29, 32, 35 and 37 of the original list were finally selected to constitute perception scale. The scale values ranged from 1.21 to 3.98 with 0.5 class interval.

Method of scoring to find reliability

The selected 17 statements for the final format of the perception scale were randomly arranged to avoid response biases, which might contribute to low reliability and detraction from validity of the scale. Out of the 17 selected statements, ten statements were the indicators of the unfavourable perception and seven statements were the indicators of favourable perception. Against these 17 statements, there were five

columns representing five point continuum of agreement and disagreement to the statements as followed by Likert (1932) in his summated rating technique of perception measurement. The five points on continuum were strongly agree, agree, undecided, disagree and strongly disagree with respective weights of 5, 4, 3, 2, and 1 for the favourable statements and with the respective weights of 1, 2, 3, 4 and 5 for the unfavourable statements. The weights of Likert's technique and the scale value of Thurston's 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, split-half method of testing reliability was used.

The 17 statements were divided into two halves with 9 odd numbered in one half and 8 even numbered statements in the other. These were administered to 20 non-respondent banana growers. Each of the two sets of statements was treated as a separate scale and then these two sub-scales were correlated. The coefficient of reliability was calculated by the Rulon's formula (Guilford, 1954), which came to 0.75. Reliability is directly related with the length of the scale when we split the scale on odd and even number items. The reliability coefficient which has been calculated is the value of half size of the original scale. Thus correction factor is calculated by using Spearman Brown formula. The coefficient of reliability was calculated by the Spearman Brown formula which came 0.86. Thus, the scale developed was found highly reliable. To understand this procedure, the statements for the scale in Table 4 can be examined.

Table 4: Reliability of scale

No.	Score of Odd Statements	Score of Even Statements	D	d^2	T	t^2
	X_0	X_e	$X_0 - X_e$	d × d	$X_0 + X_e$	
1	45	39	6	36	84	7056
2	44	40	4	16	84	7056
3	40	36	4	16	76	5776
4	42	36	6	36	78	6084
5	40	38	2	4	78	6084
6	45	36	9	81	81	6561
7	40	34	6	36	74	5476
8	44	38	6	36	82	6724
9	40	34	6	36	74	5476
10	42	38	4	16	80	6400
11	40	38	2	4	78	6084
12	45	40	5	25	85	7225
13	44	39	5	25	83	6889
14	42	32	10	100	74	5476
15	40	36	4	16	76	5776
16	38	32	6	36	70	4900
17	44	36	8	64	80	6400
18	43	40	3	9	83	6889
19	40	30	10	100	70	4900
20	44	40	4	16	84	7056
Total	842	732	110	708	1574	124288

Rulon's Formula

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

Where;

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

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

Calculation

$\sum d = 110$
$\sum d^2 = 708$
$t = 1574$

$\sum t^2 = 124288$

$n = 20$

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

$$\sigma^2 d = \frac{708 - \frac{(110)^2}{20}}{20}$$

$$\sigma^2 d = \frac{708 - 605}{20}$$

$$\sigma^2 d = \frac{103}{20}$$

$$\sigma^2 d = 5.15$$

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

$$\sigma^2 t = \frac{124288 - \frac{(1574)^2}{20}}{20}$$

$$\sigma^2 t = \frac{124288 - \frac{2477476}{20}}{20}$$

$$\sigma^2 t = \frac{124288 - 123873.8}{20}$$

$$\sigma^2 t = \frac{414.2}{20}$$

$$\sigma^2 t = 20.71$$

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

$$rtt = 1 - \frac{5.15}{20.71}$$

$$rtt = 1 - 0.2486$$

$$rtt = 0.75$$

Calculation of correction factor

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

Where
rtt = Coefficient of reliability of original test

roe = reliability of coefficient of odd and even score

$$rtt = \frac{2 \times 0.75}{1+0.75}$$

$$= \frac{1.50}{1.75}$$

$$= 0.86$$

Content validity of the scale

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

Administering the developed scale

The respondents were asked to express their perception in terms of their agreement or disagreement with each item by selecting one of five response categories. The responses were collected on a five point continuum and scoring techniques was used as mentioned in step 5. The total perception score for each respondent banana grower was obtained by adding all the scores of his/her responses for all the statements. Then, using arbitrary method of classification the respondents were grouped into five categories *viz.*, very low (up to 30.60), low (30.61 to 44.20), medium (44.21 to 57.80), high (57.81 to 71.40) and very high (above 71.40 score) perception. The maximum obtainable score by the respondents was 85 and minimum was 17.

Conclusion

The present study represented a scale to measure perception of banana growers about Good Agricultural Practices (GAPs). Final version of the scale is ready to use by the academician, researchers or policy makers.

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