

A SCALE FOR MEASURING THE AGRICULTURAL MODERNIZATION OF THE TRIBAL FARMERS

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ABSTRACT

For constructing the agricultural modernization scale, the various indicators followed: innovativeness, cosmopolitaness, extent of utilization of mass media, cropping pattern, seed selection, adoption of micro irrigation system, marketing of agricultural production and dairy produce, available modern machinery and implements, adoption of Integrated Nutrient Management, use of organic fertilizers, storage facility, extent of adoption of plant protection measures and adoption of improved dairy practices. A scale to measure the agricultural modernization of the tribal farmers was developed by using normalised rank approach method. Total seventeen possible indicators of agricultural modernization were selected for the scale and circulated to a group of 102 judges from State Agricultural Universities (SAUs) and various related institutions. Out of 102 judges 73 responded. Their opinion was utilised for item analysis. Out of the seventeen indicators, thirteen indicators were selected as they were found relevant by 75 or more per cent of the judges. While four indicators were delete. In order to determine the scale value of each items ranked by judges, the centile position "P" value was worked out. Those indicators which received one or more than one positive "P" value were considered. All thirteen relevant indicators were finally selected for the scale. Validity of the scale was confirmed by content validity. Split halves technique of reliability was used to determine the reliability of the scale.

Keywords: scale construction; agricultural modernization; tribal farmers; ITDP

INTRODUCTION

Agricultural modernization means from traditional agriculture to modern agriculture transformation process and means by a farmer. In this process, the agriculture with modern industry, increasing in modern science and technology and modern economy management method, make-up the agricultural productivity by backward traditional agriculture increasingly into contemporary world advanced level of agriculture. However, agricultural modernization is the very complex phenomenon, which is related to so many indicators and has positive link with economic development. To be precise, any action process is depending upon so many factors involved in the situation. Hence, an attempt has been made here to identify the indicators of the agricultural modernization. Considering the evidence from various studies, literature discussed above and judged by a panel of judges, the main indicators of agricultural modernization were selected for construction of agricultural modernization scale. The main indicators were as follows: (i) innovativeness (ii) cosmopolitaness, (iii) extent of utilization of mass media (iv) cropping pattern (v) seed selection (vi) adoption of micro irrigation system, (vii) marketing of agricultural production

and dairy produce, (viii) available modern machinery and implements (ix) adoption of Integrated Nutrient Management (x) use of organic fertilizers (xi) storage facility (xii) extent of adoption of plant protection measures and (xiii) adoption of improved dairy practices. Agricultural modernization was considered to be the function of all the above indicators jointly.

OBJECTIVE

To construct the scale for measuring the agricultural modernization of the tribal farmers

METHODOLOGY

A scale to measure the agricultural modernization of the tribal farmers was developed by using Normalized Rank Order Method (NROM) recommended by Guilford (1954). The method adopted as followed by Biradar *et al.*, (2015), Vinaya *et al.*, (2016 & 2018) and Chauhan and Patel (2020), which consists of the following steps.

(1) Identification of the indicators

The possible indicators of agricultural modernization

were identified after reviewing the related literature. After thorough scrutiny and comprehensive understanding, these indicators were consulted with the experts. Finally, seventeen possible indicators of agricultural modernization were considered for the scale. The indicators were then circulated to judges of different disciplines.

(2) Selection of judges

A group of 102 experts, thinkers, educationists and administrators from eleven State Agricultural Universities from different states *viz.*, Gujarat, Rajasthan, Maharashtra, Punjab, New Delhi, Haryana, Tamil Nadu, Andhra Pradesh, Karnataka, Himachal Pradesh and Uttar Pradesh *etc.* Centre of advanced studies in Agricultural Extension of Indian Agricultural Research Institute, New Delhi and other related institutions were selected as judges to develop the agricultural modernization scale.

(3) Jury opinions

An official letter was mailed to all the selected judges with a request to give their valuable opinion regarding the relevancy and importance of the listed indicators to develop the agricultural modernization scale for tribal farmers. Out of 102 judges, 70 (62.50%) judges responded within a stipulated time of two months from the date of dispatch. Their opinion was taken into consideration for items analysis.

(4) Relevance of scale items

In order to judge the relevancy of major indicators, judges were asked to assign the rank to the retained indicators according to their relative importance in measurement of agricultural modernization of the tribal farmers. Those indicators found relevant by more than 75 per cent judges were considered as relevant items for the construction of the scale.

(5) Ranking of the selected indicators

In order to obtain the rank of the selected indicators of the scale, same judges' opinion was used. The judges were requested to rank the selected indicators according to their relative importance in measuring agricultural modernization of the tribal farmers. Finally, important indicators were selected on the basis of rank acquired by them. Out of seventeen indicators, thirteen indicators were selected while; four indicators were discarded. The details regarding the indicators selected are stated in Appendix-II.

(6) Item analysis

After receiving the responses of judges, a master table was prepared and data were tabulated on the basis of jury opinion.

(7) Computing scale value

In order to determine the scale value of each item ranked by judges, the centile position "P" based on the method suggested by Guilford (1954) was worked out. The "C" values (values determined to each centile value), R_j values and finally scale values, *i.e.* R_c values, were worked out by using following formula.

$$R_c = 2.357 R_j - 7.01$$

Those indicators which received one or more than one positive scale value (R_c) were considered as relevant indicators for inclusion in the scale. All the thirteen main indicators obtained more than one positive value, so all the indicators were finally selected for the scale.

(8) Identification of sub-items (Statements)

Under each identified major indicator of agricultural modernization, sub-items (statements) were identified based on past review and discussion with advisory committee members. These statements were then discussed with another set of 30 local experts including professors, scientists, extension personnel *etc.* by arranging conference. They were requested to add or delete sub-items from the list. Further, they were requested to score each of the sub-items according to their importance in measuring the main indicator of agricultural modernization. Finally, each sub-item was scored.

(9) Reliability of the scale

Split half technique of reliability, which is in wide use, was employed to determine the reliability of the scale. This technique gives the coefficient of internal consistency. According to the method, the scale was divided into two equal parts *i.e.*, taking even numbers on one side and odd numbers on other. It was administered to 60 tribal farmers, which were not included in the final study as sample.

The two sets of agricultural modernization index for each of the 60 tribal farmers were introduced as a full scale and correlation between two sub-scales was calculated by using Pearson product moment correlation coefficient formula. The 'r' value 0.674 was significant at 0.01 levels of significance indicating that the scale was reliable.

(10) Validity of the scale

Validity of the scale was confirmed by content validity.

(10.1) Content validity

According to Kerlinger (1976), the content validity

is the representativeness or sampling adequacy of the content, the substance, the matter and the topic of measuring instrument. Further, he stated that the content validation consists in judgment by one judge alone and/or with others, the representativeness of the items. In the present study, indicators included in the scale were arrived at only after wide and critical validation by the panel of judges.

RESULTS AND DISCUSSION

Construction of a scale to measure the agricultural modernization of tribal farmers

For constructing the agricultural modernization scale, the various procedures followed are discussed below under the following sub-heads.

(1) Identification of the indicators

In order to identify the basic constituents of agricultural modernization, a good number of items pertaining to agricultural modernization were collected through review of literature and discussion with academic staff and members of the advisory committee. In all, seventeen items were selected tentatively as main indicators of agricultural modernization of tribal farmers.

These indicators were then mailed to 102 judges, the academic, administrative and extension personnel working in various State Agricultural Universities (SAUs), Indian Agricultural Research Institute (IARI), Indian Council of Agricultural Research (ICAR) and other institutions. The judges were requested to indicate whether each of the main indicator sent to them was relevant or not for inclusion in the scale. The judges were also requested to rank the relevant indicators according to their relative importance in measurement of agricultural modernization of the tribal farmers. The response was received from 73 judges. Finally, responses of 70 judges were considered by rejecting three judges’ responses due to incomplete response.

The details of judges are given in Table 1.

Table 1 : Details of the judges (n = 70)

Sr. No.	Details of judges	Number	Per cent
1	Directors	04	05.71
2	Professors/equivalent	17	24.29
3	Associate Professors/equivalent	19	27.15
4	Assistant Professors/equivalent	22	31.42
5	Senior Research Assistant	08	11.43

Based on judges’ opinion, the main indicators were finalized. Then, under each main indicator, sub-items were finalized. For finalization of sub-items, another set of local experts, professors and scientists were contacted and

a conference was organized for determination of the sub-items. They were requested to add/delete sub-items from a previously prepared list, which they believe to be suitable/not suitable for measuring each main indicator. Further, they were requested to score each sub-indicator according to their importance in measuring the main indicators of the agricultural modernization of tribal farmers. On the basis of their suggestions, total 100 statements of the identified thirteen main indicators with a maximum score of 212 were included in the instrument developed for measuring the agricultural modernization of tribal farmers.

(2) Relevancy of scale items

The responses received from 70 judges supported the relevancy of the thirteen main indicators. Those items, which received more than 75 per cent responses, were considered as relevant items for inclusion in the scale. Total four indicators viz., sources of information used (65.71 %), extent of use of information communication technology (71.42 %), steps followed to prevent post harvest losses (67.14 %) and value addition (64.28 %) were found less relevant and hence, were removed from the scale items and finally thirteen main indicators were included in the agricultural modernization scale of tribal farmers. The details on relevancy of each item are furnished in Table 2.

Table 2: Relevancy of scale items as judged by the judges

(n = 70)

Sr. No.	Item	Relevance	
		Number	Per cent
1	Innovativeness	65	92.85
2	Cosmopolitaness	66	94.28
3	Extent of utilization of mass media	64	91.42
4	Available modern machinery and implements	62	88.57
5	Adoption of improved dairy practices	58	82.85
6	Storage facility	55	78.57
7	Cropping pattern	64	91.42
8	Use of organic fertilizers	59	84.28
9	Seed selection	60	85.71
10	Adoption of micro irrigation system	58	82.85
11	Adoption of integrated nutrient management	54	77.14
12	Adoption of plant protection measures	57	81.42
13	Marketing of agricultural and dairy produce	62	88.57

(3) Obtaining scale values

The ranks for the selected main indicators were assigned using the same set of judges. The judges were asked to rank the main relevant indicators according to their relative importance in measurement of agricultural modernization of tribal farmers. Based on the rank assigned by the judges to

each of the selected and relevant main indicators, the scale values of all the main indicators were calculated using the Normalized Rank Approach as suggested by Guilford (1954). The various indicators selected along with their scale values is given in Table 3.

Table 3: Scale value of main indicators of the agricultural modernization scale

(n= 70)

Sr. No.	Indicators	Scale value
1	Innovativeness	6.52
2	Cosmopolitaness	6.45
3	Extent of utilization of mass media	6.18
4	Available modern machinery and implements	5.24
5	Adoption of improved dairy practices	5.07
6	Storage facility	4.70
7	Cropping pattern	4.60
8	Use of organic fertilizers	4.26
9	Seed selection	4.16
10	Adoption of micro irrigation system	4.00
11	Adoption of integrated nutrient management	3.83
12	Adoption of plant protection measures	3.69
13	Marketing of agricultural and dairy produce	3.22

It is apparent from Table 3 that the highest scale value was obtained by the indicator, innovativeness (6.52) and the lowest scale value was assigned to adoption of improved dairy practices (3.22) in the scale. All the main indicators and their scale values were indicated in the descending order. The details regarding the scale value computed are given in Appendix-I.

(4) Reliability of the scale

The split-half method of reliability was used. The scale was administered to 60 non-sampled tribal farmers from the research area. The score for the alternate items were separated and two sets were prepared. The coefficient of correlation was calculated for the two sets of score. The coefficient of correlation obtained was 0.674 which was significant at 1 per cent level of probability. Hence, the scale was dependable or stable as a measuring instrument.

(5) Validity of the scale

The validity of the scale was confirmed by content validity. The content validity of the scale was achieved by two ways. Firstly, the indicators collected and selected for inclusion in the scale are based on an extensive and exhaustive literature and secondary, the opinion of panel of 70 judges

was obtained to know the appropriateness of the indicators for inclusion in the scale. More than 75 per cent judges endorsed the proposed indicators as relevant indicating the scale was valid.

CONCLUSION

A scale to measure the agricultural modernization of the tribal farmers was developed by using normalised rank approach method. Total seventeen possible indicators of agricultural modernization were selected for the scale and circulated to a group of 102 judges from State Agricultural Universities (SAUs) and various related institutions. Out of 102 judges 73 responded. Their opinion was utilised for item analysis. Out of the seventeen indicators, thirteen indicators were selected as they were found relevant by 75 or more per cent of the judges. While four indicators were delete. In order to determine the scale value of each items ranked by judges, the centile position “P” value was worked out. Those indicators which received one or more than one positive “P” value were considered. All thirteen relevant indicators were finally selected for the scale. Validity of the scale was confirmed by content validity. Split halves technique of reliability was used to determine the reliability of the scale.

APPENDIX - 1
SCALE VALUE

Rank r_i	Rank values R_j	STAT EMENTS													Total	P	C	Sr. No.	The components of the scale with the scale value			
		A	B	C	D	E	F	G	H	I	J	K	L	M					Statements	Scale Value	Rank	
1	13	8	7	7	10	2	9	3	5	6	1	7	1	4	70	96.15	9	1	Innovativeness	6.52	I	
2	12	13	9	9	2	6	1	3	4	8	5	5	4	1	70	88.46	8	2	Cosmopoliteness	6.45	II	
3	11	7	6	12	3	3	9	8	1	4	4	4	7	2	70	80.76	7	3	Extent of utilization of mass media	6.18	III	
4	10	4	10	5	7	1	8	8	9	2	3	3	3	7	70	73.07	6	4	Cropping pattern	5.24	IV	
5	9	6	7	3	4	12	5	8	6	4	2	7	2	4	70	65.38	6	5	Seed selection	5.07	V	
6	8	3	9	1	9	1	4	7	8	2	6	5	9	6	70	57.69	5	6	Marketing of agricultural and dairy produce	4.7	VI	
7	7	6	4	7	8	9	3	1	5	6	8	4	4	5	70	50.00	5	7	Adoption of micro irrigation system	4.6	VII	
8	6	4	3	3	3	13	4	6	5	3	7	2	10	7	70	42.30	5	8	Available modern machinery and implements	4.26	VIII	
9	5	1	5	4	5	9	3	4	2	11	9	6	7	4	70	34.61	4	9	Adoption of integrated nutrient management	4.16	IX	
10	4	7	2	5	6	6	1	7	5	3	10	3	8	7	70	26.92	4	10	Storage facility	4	X	
11	3	2	1	7	4	5	6	5	7	4	9	8	3	9	70	19.23	3	11	Use of organic fertilizers	3.83	XI	
12	2	5	5	6	6	1	9	6	9	10	1	5	2	5	70	11.53	2	12	Adoption of Plant Protection Measures	3.69	XII	
13	1	4	2	1	3	2	8	4	4	7	5	11	10	9	70	03.84	1	13	Adoption of Improved Dairy Practices	3.22	XIII	
Σf_i		70	70	70	70	70	70	70	70	70	70	70	70	70	910							
Σf_{ic}		402	400	392	364	359	345	348	335	332	322	327	318	304	4548							
$MC = R_j$		5.74	5.71	5.6	5.2	5.12	4.92	4.97	4.78	4.74	4.6	4.67	4.54	4.34	64.97							
$RC^* =$		6.52	6.45	6.18	5.24	5.07	4.60	4.70	4.26	4.16	3.83	4.00	3.69	3.22	62.00							

* $RC = 2.357 R_j - 7.01$

Following formula was used to know the relevancy of each indicator Appendix-I continued.

$$\begin{aligned}
 P &= \frac{(R_i - 0.5) 100}{n} \quad n = 13 \\
 &= \frac{(13 - 0.5) 100}{13} \\
 &= 12.5 \times 100 / 13 \\
 &= 96.15
 \end{aligned}$$

Where,

- A = Innovativeness
- B = Cosmopolitanness
- C = Extent of use of mass media
- D = Cropping pattern
- E = Seed selection
- F = Adoption of micro-irrigation system
- G = Marketing of agricultural and dairy produce
- H = Available modern machinery and implements
- I = Adoption of Integrated Nutrient Management
- J = Use of organic fertilizers
- K = Storage facility
- L = Adoption of plant protection measures
- M = Adoption of Improved Dairy Practices
- r_i = Ranks given by judges to thirteen components
- R_i = $(n - r_i + 1)$ Rank values (in the reverse order of rank *i.e.*, rank one getting thirteen, rank two getting twelve and rank thirteen getting one)
- P = Centile value
- N = Number of variables ranked.

the deduction of 0.5 from the rank value is simply to get the middle of the area for the things so ranked

- C = Values determined to each centile value (P)
- f_{ii} = Total number of judges who have ranked thirteen components
- f_{iic} = Ca or CE (Summation of each statement rank value multiple with C value)
- MC = $RJ = f_{iic} / f_{ii}$
- R_c = (Scale value) = $2.357 R_j - 7.01$

REFERENCES

- Alem, A. (1999). Implements and tools and their appropriateness in different environment - Krishi Vigyan Kendra - A reality. Edited by Das, P. and Hansara, B.S., Division of Agricultural Extension, Indian Council of Agricultural Research, New Delhi-25.
- Arnon, I. (1989). Modernization of agriculture in developing countries, resources, potentials and problems. John Wiley and Sons, A Wiley - Inter Science Publication, Chester, New York.
- Biradar Gangappagouda, Gangadharappa, N. R., Vinaya Kumar, H. M. and Shivamurthy, M. (2015). Development and Validation of a Scale to Measure Economic Contribution of Agricultural Extension Service (ECoAES) Provided Under Karnataka Watershed Development Programme. *Trends in Biosciences*. 8(7): 1780-1786.
- Chauhan, C. D. and Patel, J. B. (2020) A scale to measure the attitude of member farmers of gram panchayat towards Pradhan Mantri Fasal Bima Yojana. *Guj. J. Ext. Edu.* 31(1):1-5.
- Guilford, J.P. (1956). Fundamental statistics in Psychology and Education. McGraw Hill Book Co. Inc., New York. 317-319.
- Guliford, J.P. (1954). Psychometric Methods. Tata McGraw-Hill Publications Co. Ltd., Bombay. pp. 378-382.
- Kerlinger (1976). Foundation of Behavioral Research. Surjeet Publication, Delhi. pp. 198-204.
- Sahu, P.K. (2010). Agriculture and Applied Statistics-I, Kalyani Publisher, New Delhi.
- Vinaya Kumar H. M., Patel J. B. and Chauhan, N. B. (2018). Attitude of farmers towards Agricultural Produce Market Committee. *Guj. J. Ext. Edu.*, 29(2): 224-226.
- Vinaya Kumar, H. M., Shivamurthy, M. and 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.

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