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RESEARCH ARTICLE

A scale to measure attitude of farmers towards organic farming in Rajasthan

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Abstract

When planning extension work in the region, it is important to understand farmers' attitudes, as this helps in assessing their mindset and shaping better strategies. The purpose of this study was to develop a valid and reliable instrument scale for assessing farmers attitude towards organic farming. The technique chosen to develop the attitude scale was Likert's method of summated rating for ascertaining the response on the scale. Initially 55 statements were selected for construction of scale out of which 16 statements (9 positive and 7 negative) were finally selected to build a scale that would assess the attitude of farmers towards organic farming. The developed scale demonstrated reliability, with a reliability coefficient of 0.80 and its validity was assessed using content validity. Utilizing this scale in research will provide insights into farmers' perspectives on organic farming and assist policymakers in designing strategies to promote sustainable agricultural practices.

Keywords: extension work; Likert's method of summated rating; reliability coefficient; scale construction; split-half method

Introduction

Agricultures origins were characterized by independent developments across various regions worldwide, encompassing a wide array of plant and animal species. The advent of agriculture roughly 12000 years ago marked a transformative shift in human existence. It saw a transition from nomadic hunter-gatherer lifestyles to the establishment of permanent settlements and the practice of farming (1). The world of agriculture was previously a world of organic cultivation. Organic agriculture has fed India form many decades and it was the only way to cultivate crops without any fertilizer or pesticides use before 19 century and can be regarded as conventional farming of that era (2). In the pursuit of sustainable agricultural practices, organic farming has emerged as a promising alternative to conventional methods (3). Organic farming is considered a modern approach to agriculture, focused on developing an environmentally friendly production system. This ensures the sustainability of agriculture for future generations. It not only revitalizes farming but also benefits consumers, promoting a healthier and happier lifestyle (4). Intensive agriculture, driven by high-yielding crop varieties, increased use of fertilizers, chemicals and irrigation, boosts productivity. However, excessive reliance on chemical fertilizers, pesticides and herbicides has harmful and lasting effects on soil health, fertility and air pollution. Additionally, environmental damage leads to lower food quality, affects consumers and raises cultivation costs. Organic farming helps preserve soil microorganisms and supports a healthier environment. Encouraging widespread adoption of organic farming practices among farmers can be an effective strategy to address these challenges (5). With the increasing demand for organic produce due to concerns about environmental sustainability and human health, the cultivation of organic has garnered substantial attention in recent year (6).

Rajasthan is positioned as the fourth-largest state in India in terms of the area under organic farming, boasting a substantial 580092.22 hectares. Out of the total cultivated area, 215299.44 hectares are actively under organic cultivation, while an additional 364792.79 hectares are in the process of conversion (7). Rajasthan ranks fourth in terms of land devoted to organic farming practice, faces unique challenges due to its arid & semi-arid climatic condition. In line with the upcoming changes in agriculture system in Rajasthan, it becomes imperative to study the attitude of the local farmers towards organic farming. The study of attitude of the farmers would help in preparing the diffusion and adoption strategies for promoting organic farming in Rajasthan Since the region has a unique socio-cultural and economic conditions along with challenges put forth by the arid

& semi-arid climatic condition any development intervention in a desired direction would be accomplished only if it is compatible with the prevailing attitude of the clients (in this case local farmers of Rajasthan) for whom the interventions are designed. Therefore, a need was felt to develop a scale to study the attitude of the farmers towards organic farming in Rajasthan, which would be of immense utility for use by any intervening agency like state department of agriculture, agriculture research institutes and NGOs working in the domain area.

Materials and Methods

Social scientists and researchers employ various scaling techniques to measure socio-psychological constructs, such as attitudes and perceptions, in the field of social sciences. In this study, a scale was developed by using Likert's method of summated rating (8). A summated rating scale consists of set of items (statements) to which the subject responds with degree of agreement or disagreement carrying different scores.

Steps in developing a scale to measure farmers' attitude toward organic farming

The following step were followed for construction of scale:

Items collection and editing the statement

The first step is obtaining items/statements which represent the universe. The items encompassing the entire content scope were formulated and gathered from relevant literature, discussion with experts and professionals engaged in organic farming in Rajasthan. An initial set of 65 statements on attitudes toward organic farming was drafted, covering various dimensions such as socio-economic factors, associated complexities, personal preferences, environmental benefits, knowledge of organic farming, social impacts and technological aspects. The statements were meticulously reviewed and refined following the fourteen criteria and guidelines proposed by (9). From the initial 65 statements, 55 were selected based on their clarity, simplicity and neutrality, ensuring they were non-factual, unambiguous and effectively conveyed the intended ideas.

Relevancy test

Not all the collected statements are equally relevant in assessing farmers' attitudes toward organic farming. Hence, these statements are subjected to scrutiny by an expert panel to determine their relevancy and their screening for final inclusion in the scale. The panel consisted of experts in extension education and related disciplines from various State Agricultural Universities (SAUs), State Departments and Extension Institutes. The statements were sent 100 judges with necessary instruction to critically evaluate each statement for its relevancy. The judges were requested to their response on five-point continuum *viz.,* highly relevant, relevant, neutral, irrelevant, highly irrelevant with scores 5,4,3,2 and 1, respectively. Out of the 100 experts, only 45 responded within four weeks. The relevancy scores of each item were ascertained by adding the scores on rating scale for all the 45 expert's responses. Using this data, the relevancy percentage, relevancy weightage and mean relevancy scores were determined for each statement using specific formulae.

Relevancy Percentage (RP): RP is worked out by summing up the frequency scores of highly relevant, relevant and neutral categories *i.e.,* number of respondents who rated the statement highly relevant, relevant and neutral which are converted into percentage.

$$RP = \frac{FS}{MPS} \times 100$$

Where,

RP= Relevancy Percentage

FS = Frequency Scores

MPS= Maximum possible scores

Relevancy Weightage (RW): IT is the ratio of actual score obtained to the maximum possible scores (MPS) obtainable for each statement. Relevancy weightage is obtained by the formula

$$RW = \frac{HRR + RR + NR + IR + HIR}{MPS}$$

Where,

RW= Relevancy Weightage

HRR= High Relevant Response

RR= Relevant Response

NR= Neutral Response

IR= Irrelevant Response

HIR= Highly Irrelevant Response

MPS= Maximum possible scores

Mean Relevancy Scores (MRS): It is the ratio of actual scores obtained by each respondent to the number of judges responded for the variables.

$$MRS = \frac{HRR + RR + NR + IR + HIR}{N}$$

Where,

MRS= Mean Relevancy Scores

HRR= High Relevant Response

RR= Relevant Response

NR= Neutral Response

IR= Irrelevant Response

HIR= Highly Irrelevant Response

N= Number of Experts

Using this criterion the statement was screened for their relevancy. Statement having relevancy percentage >75.00, relevancy weightage >0.70 and mean relevancy scores >4 were selected for final selection of statement. By this process 30 statement were selected and modified and rewritten as per the comments of the experts. Table 1 shows selected statement based on judge's ratings: RP, RW and MRS.

Item analysis and calculation of "t" value

Item analysis is a crucial step in the Likert method for developing a valid and reliable scale. For this purpose, item analysis was carried out on the selected 30 statements selected in the first stage. Thus, scrutinized statements representing the attitude of farmers were administrated to 30 non-sample farmers of Bikaner. The response for the statement were taken on five-point continuum *viz.,* strongly agree, agree, undecided, disagree and strongly disagree with scores of 5, 4, 3, 2 and 1, respectively. For the

Table 1. Selection of statements based on relevancy test

S.No	Statements	RP	RW	MRS
1	Applying knowledge and skills in organic cultivation can be challenging (-)	72.44	0.69	3.47
2	Organic cultivation helps to protect the environment and maintain biodiversity* (+)	96.00	0.96	4.80
3	Farmers can never obtain higher yield without use of agrochemical* (-)	79.56	0.84	4.20
4	The techniques employed in organic farming are initially more expensive and labour-intensive prove to be more cost effective in the long run (+)	68.00	0.77	3.84
5	Organic farming does not have capability to ensure food security (-)	39.11	0.55	2.76
6	Organic farming is the future of agriculture, offering sustainability and healthier food* (+)	86.22	0.87	4.36
7	Organic farming offers healthy food for the family* (+)	89.33	0.91	4.56
8	Organic farming is the need of hour (+)	70.67	0.76	3.80
9	Adoption of organic farming is not feasible because of labour scarcity (-)	48.00	0.60	3.00
10	Farmers would benefit more from focusing on the careful use of agrochemicals rather than on organic farming (+)	63.56	0.72	3.60
11	Crops produced through organic cultivation practices are of higher quality* (+)	91.56	0.92	4.62
12	Farmers are drawn towards organic farming because of its popularity in the local area (+)	59.11	0.68	3.42
13	Farmers are likely to switch towards organic farming, even if they don't receive fair prices for their products (-)	52.89	0.65	3.27
14	Organic farming saves the soil beneficial organism* (+)	84.44	0.88	4.40
15	Farmers will have the problem in sourcing and purchasing of organic inputs* (-)	76.00	0.80	4.02
16	Using a large amount of chemical fertilizer in the soil will lead to improve soil condition in the future* (-)	77.33	0.82	4.11
17	Organic farming is effective in maintaining the soil fertility in comparison to inorganic farming* (+)	88.89	0.90	4.49
18	Farmers prioritize profits over environmental concerns* (-)	83.11	0.83	4.16
19	Adoption of organic farming at small scale is worthless (-)	55.56	0.64	3.20
20	Organic foods do need to get premium prices for encouraging farmers to do organic cultivation* (+)	90.67	0.91	4.53
21	Organic farming has the problem in controlling weeds without herbicides* (-)	82.67	0.84	4.18
22	Farmers are not interested in organic farming because it is less profitable than inorganic farming* (-)	78.67	0.83	4.16
23	There is low probability of success in organic farming for illiterate farmers* (-)	75.11	0.80	4.02
24	Organic produce fetches more price in the market as compared to non-organic produce* (+)	88.44	0.89	4.47
25	Nutritional values of organic products are higher than the inorganic product* (+)	90.22	0.91	4.56
26	Switching to organic farming is an exciting new challenge (+)	69.78	0.76	3.78
27	Organically grown cereals, vegetables and fruits have higher demand than chemically grown produce* (+)	78.22	0.81	4.04
28	Organic farming will decrease the production cost by reducing the input purchases* (+)	77.78	0.82	4.09
29	Obtaining certification of organic farming is a difficult process* (-)	77.33	0.81	4.04
30	Continuous use of chemicals will encourage insect infestation* (-)	82.67	0.83	4.13
31	Organic farming can help farmers improve their standard of living* (+)	79.56	0.81	4.11
32	Growing crops organically can reduces pollution of the water, both surface and subsurface (+)	73.33	0.80	4.00
33	Organic cultivation's sustainability is low because of its low productivity. (-)	50.22	0.63	3.16
34	Organic farming ensures a balanced use of natural resources (+)	68.44	0.74	3.71
35	My forefathers' farming methods closely resemble organic farming* (+)	86.22	0.87	4.36
36	I believe young farmers should adopt organic farming to inspire the local community* (+)	83.56	0.84	4.20
37	Utilizing organic practices such as nutrient recycling may not offer significant economic benefits to the farmers (-)	43.11	0.58	2.91
38	The standards of organic farming are very complex to follow (-)	54.67	0.67	3.33
39	Management of the organic agricultural system is quite difficult (-)	55.56	0.66	3.31
40	Consumers have limited awareness regarding the health benefits of organic agriculture products (+)	66.22	0.76	3.78
41	Governmental support for organic agriculture is crucial (-)	60.44	0.71	3.56
42	Accessing information about organic farming is difficult* (-)	76.44	0.83	4.13
43	Expenses increase in organic farming because of need to transport significant quantities of organic manure (-)	57.33	0.67	3.36
44	Finding buyers, such as wholesalers who willing to pay premium prices for organic produce, is challenging. (-)	58.22	0.68	3.38
45	Transitioning from conventional farming to organic farming presents significant challenges and is difficult to adopt (-)	58.22	0.67	3.36
46	Maximizing production in organic farming can be achieved by integrating livestock rearing into our farm operations* (+)	87.11	0.88	4.40
47	Embracing organic farming represents a boon for agriculture (+)	72.89	0.76	3.80
48	Managing weeds, pests and diseases in organic farming poses significant difficulties* (-)	79.11	0.82	4.09
49	Farmers are earning higher profits from organic fruits and vegetables* (+)	78.22	0.82	4.09
50	Farmers are unwilling to sacrifice a portion of their profits for environmental conservation efforts (-)	61.78	0.71	3.53
51	Cost of production in organic farming can be lowered by utilizing crop residues as fertilizer* (+)	85.78	0.86	4.29
52	Consumers have easy access to purchase organic agricultural produce directly from the farm (+)	64.44	0.76	3.80
53	Non-organic farming practices may lead to the degradation of soil, water and natural resources in neighbouring farms (+)	73.33	0.77	3.87
54	Organic farming practices have no advantages over inorganic practices* (-)	78.22	0.81	4.04
55	It is more advisable to prioritize integrated farming system other than solely adhering to organic farming practices* (+)	89.33	0.89	4.47

* Denotes statements/items having RP >75.00, RW >0.70 and MRS >4

negative statement the scoring pattern was reversed. The respondent's response was recorded and the summated score for the total statement of each respondent was obtained. For item analysis, respondents were ranked in ascending order based on their total scores. The top twenty-five per cent with the highest scores and the bottom 25 % with the lowest scores were selected as criterion groups for assessing individual statements, following the approach suggested by (10). Consequently, out of 30 farmers, 8 farmers with the highest scores and 8 farmers with the lowest scores were chosen as the criterion group for evaluating individual items.

The critical ratio was determined using a t-test. The 't' value indicates the degree to which a particular statement distinguishes between the high and low groups. It was calculated using the formula proposed by previous researchers (10). Table 2 Shows the result of analysis of statement and their respective t- value.

$$t = \frac{\bar{X}_H - \bar{X}_L}{\sqrt{\frac{S_H^2}{n_H} + \frac{S_L^2}{n_L}}}$$

Where,

$\overline{X_H}$ = the mean score on the given statement for the high group

$\overline{X_L}$ = the mean score on the same statement for the low group

S_H^2 = the variance of the distribution of response of high group to the statement

S_L^2 = the variance of the distribution of response of low group to the statement

n_H = number of subjects in high group

n_L = number of subjects in low group

Selection of statement for final scale

After calculating the 't' value for each statement, 16 statements with the highest t-values, specifically those greater than 1.75, were selected. The criterion for rejecting items with a 't' value below 1.75 was applied, following the guideline suggested by (10). According to this rule, statements were retained in the scale based on their highest discriminative values, while those with low discriminative ability and questionable validity were eliminated.

Standardization of the scale

The scale was standardized by assessing its validity and reliability. Content validity was used to confirm its validity, while the split-half method was employed to test its reliability (11).

Reliability: A scale is deemed reliable when it consistently produces similar results upon repeated application to the same sample. In this study, the split-half method was used to assess reliability. The sixteen statements were divided into two equal halves, with eight odd-numbered statements in one half and six even-numbered statements in the other. These were then administered to 30 respondents. Each set of statements was treated as an independent scale and the two subscales were correlated. The coefficient of reliability was calculated by the Rulon's formula (12), yielding a value of 0.66.

Rulon's formula:

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

Where,

rtt = Coefficient of reliability

$\sigma^2 d$ = Variances of differences

$\sigma^2 t$ = Variances of total scores

Table 2. Farmers attitude towards organic farming statement analysis and their respective 't' values

S.No	Statements	"t" Value
1	Organic cultivation helps to protect the environment and maintain biodiversity. (+)	2.34*
2	Farmers can never obtain higher yield without use of agrochemical (-)	1.79*
3	Organic farming is the future of agriculture, offering sustainability and healthier food (+)	0.30
4	Organic farming offers healthy food for the family (+)	2.22*
5	Crops produced through organic cultivation practices are of higher quality (+)	1.05
6	Organic farming saves the soil beneficial organism (+)	1.37
7	Farmers will have the problem in sourcing and purchasing of organic inputs (-)	2.39*
8	Using a large amount of chemical fertilizer in the soil will lead to improve soil condition in the future (-)	1.88*
9	Organic farming is effective in maintaining the soil fertility in comparison to inorganic farming (+)	2.55*
10	Farmers prioritize profits over environmental concerns (-)	1.82*
11	Organic foods do need to get premium prices for encouraging farmers to do organic cultivation (+)	2.24*
12	Organic farming has the problem in controlling weeds without herbicides (-)	2.02*
13	Farmers are not interested in organic farming because it is less profitable than inorganic farming (-)	1.67
14	There is low probability of success in organic farming for illiterate farmers (-)	0.00
15	Organic produce fetches more price in the market as compared to non-organic produce (+)	2.50*
16	Nutritional values of organic products are higher than the inorganic product (+)	2.65*
17	Organically grown cereals, vegetables and fruits have higher demand than chemically grown produce (+)	1.39
18	Organic farming will decrease the production cost by reducing the input purchases (+)	4.04*
19	Obtaining certification of organic farming is a difficult process (-)	1.26
20	Continuous use of chemicals will encourage insect infestation (-)	1.78*
21	Organic farming can help farmers improve their standard of living (+)	1.57
22	My forefathers' farming methods closely resemble organic farming (+)	2.41*
23	I believe young farmers should adopt organic farming to inspire the local community (+)	1.55
24	Accessing information about organic farming is difficult (-)	1.30
25	Maximizing production in organic farming can be achieved by integrating livestock rearing into our farm operations (+)	3.12*
26	Managing weeds, pests and diseases in organic farming poses significant difficulties (-)	1.27
27	Farmers are earning higher profits from organic fruits and vegetables (+)	1.37
28	Cost of production in organic farming can be lowered by utilizing crop residues as fertilizer (+)	1.18
29	Organic farming practices have no advantages over inorganic practices (-)	1.90*
30	It is more advisable to prioritize integrated farming system other than solely adhering to organic farming practices (+)	1.41

* Denotes statements/items having 't' values equal to/greater than 1.75

* Denotes statements/items having 't' values equal to/greater than 1.75

Reliability is directly influenced by the length of the scale when divided into odd- and even-numbered items. The calculated reliability coefficient represents the value for half the original scale. When determining reliability using the split-half method, a correction factor must be applied to obtain the final reliability value. The correction factor can be calculated by using Spearman-Brown formula. For this scale, the corrected reliability was found to be 0.80.

Spearman-Brown formula:

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

Where,

rtt= Coefficient of the reliability of the original test

roe= Reliability of coefficient of odd and even score

Validity: The content validity of the scale was assessed, which refers to the representativeness and adequacy of the content, substance, subject matter and topics covered by the measuring instrument. Since the scale comprehensively addressed the domain of organic farming through a thorough literature review and expert opinions, it was assumed to meet the criteria for content validity. As a result, the scale value differences for all statements exhibited high discriminative ability, supporting its acceptance as a valid measurement tool.

Results and Discussion

The final scale consists of 16 statements, as presented in Table 3. Responses were recorded on a five-point scale, ranging from "Strongly Agree" to "Strongly Disagree," with corresponding scores of 5, 4, 3, 2 and 1, respectively. Each respondent's attitude score was determined by summing the scores obtained across all items. The possible scores on this scale range from a minimum of 16 to a maximum of 80. Based on their scores, farmers were categorized into three groups: less favourable, favourable and highly favourable attitudes. A higher score indicates a more favourable attitude toward organic farming, while a lower score reflects the opposite.

Table 3. Statements selected for inclusion in the final scale

S.No	Statements	Degree of Agreement				
		SA	A	UD	DA	SDA
1	Organic cultivation helps to protect the environment and maintain biodiversity (+)					
2	Organic farming offers healthy food for the family (+)					
3	Organic farming is effective in maintaining the soil fertility in comparison to inorganic farming (+)					
4	Organic foods do need to get premium prices for encouraging farmers to do organic cultivation (+)					
5	Organic produce fetches more price in the market as compared to non-organic produce (+)					
6	Nutritional values of organic products are higher than the inorganic product (+)					
7	Organic farming will decrease the production cost by reducing the input purchases (+)					
8	My forefathers' farming methods closely resemble organic farming (+)					
9	Maximizing production in organic farming can be achieved by integrating livestock rearing into our farm operations (+)					
10	Farmers can never obtain higher yield without use of agrochemical (-)					
11	Farmers will have the problem in sourcing and purchasing of organic inputs (-)					
12	Using a large amount of chemical fertilizer in the soil will lead to improve soil condition in the future (-)					
13	Farmers prioritize profits over environmental concerns (-)					
14	Organic farming has the problem in controlling weeds without herbicides (-)					
15	Continuous use of chemicals will encourage insect infestation (-)					
16	Organic farming practices have no advantages over inorganic practices (-)					

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

Conclusion

The development and standardization of the scale aim to facilitate research on the behavioural aspects of organic farming. The Likert summated rating scale method was employed to construct the attitude scale. Initially, 65 statements were drafted, out of which 55 were retained after refinement by experts and based on specific criteria. Further evaluation through expert responses and a relevancy test reduced the number of statements to 30. An item analysis was then conducted on these 30 statements, ultimately selecting 16 statements (9 positive and 7 negative). The developed tool has a reliability coefficient of 0.80, which indicating high consistency and making it applicable in various contexts. The scale encompasses diverse topics related to organic farming and is expected to contribute to shifting farmers' attitudes toward organic agriculture. With necessary modifications, this scale can also be utilized to assess attitudes beyond the study area perspective. Additionally, it will support policymakers in formulating strategies for promoting sustainable agricultural practices.

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Authors' contributions

VD designed methodology, conducted the experiment in the form of survey and wrote original manuscript. MK provided concepts, supervised as guide, reviewed and final approval of the manuscript. SM help in data analysis and YK help as an expert for validation of content. All authors read and approved the final manuscript.

Compliance with ethical standards

Conflict of interest: The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Ethical issues: None

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