



Development and Standardisation of Scale to Measure Attitude of the Farmers towards Natural Farming: A Sustainable Environmental Approach

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

Attitude is defined as the degree of favourable or unfavourable feeling of the farmers towards natural farming. Natural farming, a sustainable agricultural practice that eschews synthetic inputs, has garnered significant interest globally for its potential to enhance soil health, biodiversity and crop resilience. Understanding farmer's attitude towards natural farming is crucial for its widespread adoption. It is the accepted fact that attitude of an individual plays an important role in determining ones behaviour. Keeping this in view a standardized scale has been developed to assess the attitude of the farmers towards natural farming. The Likert's summated rating method was used to construct the scale. The process started with collection of items followed by relevancy testing and item analysis and checking the reliability and validity for precision and consistency. A total of twenty four statements were finally retained for measuring attitude of the farmers towards natural farming, out of which fourteen statements were positive and ten statements were negative. The reliability was checked using split-half method and validity was examined through content validity. The scale developed was found highly reliable and valid.

Keywords: Attitude; farmers; natural farming; likert scale; standardisation.

1. INTRODUCTION

In recent years, there has been growing concern about the environmental and human health impacts of the excessive use of agricultural pesticides, fertilizers and other chemicals [1]. Besides, climate change poses a significant threat to world food production, necessitating the adoption of sustainable agricultural practices. Natural farming emerges as a viable alternative to chemical-intensive farming [2]. Natural farming improves soil fertility reduces greenhouse gas emissions, enhances farmers' income and thus can be considered a prominent strategy for preserving the planet for future generations (NMONF) [3].

Natural farming represents a chemical-free farming system deeply rooted in Indian tradition, complemented by modern insights into ecology, resource recycling, and on-farm resource optimization. Natural farming has been recognised as an important pathway for achieving sustainable development goals and is said to have the potential to meet 169 targets of SDGs (FAO) [4]. Natural farming presents a remedy to numerous issues including food insecurity, farmer distress and health concerns stemming from pesticide and fertilizer residues in food and water, as well as global warming, climate change, and natural disasters. Additionally, it holds promise for creating employment opportunities, which can help curb the migration of rural youth. As implied by its name, Natural farming embodies the art, practice, and increasingly, the science of collaborating with nature to achieve greater outcomes with fewer inputs (NITI AAYOG) [5].

An individual's attitude reflects their positive or negative feeling toward something, which further influences their actions. In the social sciences, the scaling technique is most commonly employed to measure or order entities related to quantitative traits or attributes [6]. The Likert scale is frequently used in social sciences research to measure attitude mentioned by Tanujaya *et al.*, [7]. In this study, attitude was operationalized as the set of beliefs and mental state of readiness organized through experience that influence the individual's response towards natural farming. Attitude drives an individual's development and significantly influences how one think, perceive and act [8]. Studying one's attitude towards something offers an insight of how encouraged or discouraged they feel about that subject [9]. To promote the uptake of natural farming, farmers must possess sufficient knowledge about it and harbour a positive attitude toward this approach. Changes in both knowledge and attitude are crucial precursors to adopting new practices. There is limited research in this area, hence the present study was designed to address the gap by developing a standardized scale to explore farmer's attitudinal orientation towards natural farming.

2. METHODOLOGY

A step-by-step procedure of Likert's summated ratings was followed to develop a standardized attitude scale. Likert's summated ratings, a scale construction technique in which statements (items) expressing either favourable or unfavourable opinions about a psychological object are standardized. This method was used to assess the attitudinal orientation of a group of

individuals towards a specific object as suggested by Likert [10]. This technique offers advantages over other methods of scale construction and standardization due to its simplicity in scoring and summarizing the gathered information [11]. The process involved several steps, including item collection, relevancy testing, item selection, item analysis, reliability testing and validity testing.

During the item collection process, 75 sets of statements were gathered through a review of literature and consultations with agricultural scientists, extension experts, farmers and through personal experiences. These statements were then screened using the 14 criteria proposed by Edwards [12] for attitude scale construction. As a result, a set of 53 statements that met the scaling criteria were ultimately selected from the pool of collected items.

The relevancy test involved sending the selected items to experts in the field of agriculture for their judgment. The set of 53 statements that passed the item collection process were sent to 100 judges through direct contacts, e-mails as well as Google survey forms. The judges were asked to assess the relevancy of the items, their difficulty level and their content validity in a four-point continuum viz., Highly Relevant (HR), Moderately Relevant (MR), Slightly Relevant (SR) and Less Relevant (LR) with scores 4, 3, 2 and 1 against each item. The judges were also asked to make necessary modifications, addition or deletion of the items. The responses were received from 40 judges and were subjected to Standard Normal Deviate test (z test). After giving the scores to the statements, 'z' values were calculated for each statement and \bar{z} was calculated. All the statements with 'z' values above \bar{z} (0.00) were selected as the scalable statements. The statements with 'z' values below \bar{z} were eliminated.

The set of 40 statements that satisfied the criteria of relevancy test (i.e., above relevancy mean score) were administered to 60 farmers practising natural farming in Tirupati and Ananthapuramu districts of Andhra Pradesh state i.e., non-sampling areas of my research. The data was gathered through personal interview method. The respondents were asked to indicate their degree of agreement on a five point continuum namely; Strongly agree, Agree, Undecided, Disagree and Strongly disagree with scores of 5 to 1 for each positive statements and 1 to 5 for each negative statements respectively.

The scores for their response was summed up and arranged in a descending order. The high and low group was selected, which were the top 25 per cent of the respondents with highest total score and the bottom 25 per cent respondents with lowest total score respectively to calculate the critical ratio i.e., 't' value for each statement. The calculated 't' value for each statement will measure the extent to which the statement differentiates between the respondents of high group and low group and was calculated by using the formula suggested by Edwards (1969).

$$t = \frac{(\bar{X}_H - \bar{X}_L)}{\sqrt{\frac{\sum(\bar{X}_H - \bar{X}_L)^2 + \sum(\bar{X}_L - \bar{X}_L)^2}{n(n-1)}}$$

Thus the statements with t-values greater than 1.75 were considered as scalable statements and were finalised. The final attitude scale was then tested for its reliability and validity.

3. RESULTS AND DISCUSSION

3.1 Item Collection

The results of the item collection procedure revealed that 53 statements, that satisfied the 14 criteria for attitude scale construction suggested by Edwards (1969), were selected from the 75 statements collected. The 22 statements that did not satisfy the criteria were deleted.

3.2 Relevancy Test

The set of 53 items selected was sent to 100 judges through direct contacts, e-mail as well as Google survey forms. The selected judges were experts in the field of Agriculture and Natural farming. The responses were received from 40 judges and were subjected to further analysis. The results of mean relevancy test analysis revealed that among the 53 items that were subjected to relevancy test, 40 statements made it to the cutoff point of mean relevancy score \bar{z} (0.00). However, 13 statements below the relevancy mean score were deleted from the scale. Thus, 40 out of 53 statements were selected through relevancy testing. The list of statements selected along with their 'z' values was given in Table 1.

3.3 Item Analysis

The set of 40 relevant statements were administered to 60 farmers practicing natural

farming in Tirupati and Ananthapuramu districts, Andhra Pradesh. Data was collected through personal interviews, where respondents indicated their agreement on a five-point scale: Strongly agree, Agree, Undecided, Disagree and Strongly disagree, with scores ranging from 5 to 1 for positive statements and 1 to 5 for negative statements. The responses were summed and ranked in descending order. The top 25% and bottom 25% of respondents, based on total

scores, were selected to calculate the critical ratio (t-value) for each statement. After computing 't' values for all the 40 statements, 24 statements with the 't' values more than 1.75 were selected for the final attitude scale, out of which were 14 positive statements and 10 were negative as presented in the Table 2. The results of the item analysis showed that the statements were able to differentiate between the high and the low groups.

Table 1. Selection of the attitude statements based on relevancy test

| Statements | Relevancy (Z value) |
|---|---------------------|
| Adopting natural farming practices will improve the quality of agricultural produce | 0.19# |
| Natural farming enhances biodiversity on the farm and promotes a healthier ecosystem | 0.26# |
| Natural farming improves the overall health of consumers by providing chemical-free produce | 1.37# |
| Natural farming is a mixed approach of traditional and modern farming methods | -0.83 |
| There is no strong support from government for natural farming* | 1.33# |
| Natural farming practices are more in tune with the natural cycles of the environment | -1.49 |
| Natural farming enhances the resilience of my farm in tune with the changing environmental conditions | 0.76# |
| Transitioning to natural farming helps to reduce operational costs in the long run | 0.81# |
| Pests and diseases doesn't control quickly through natural farming practices* | -1.47 |
| Natural farming is beneficial to only small and marginal farmers* | 1.37# |
| Natural farming mitigates soil erosion and soil degradation besides improving soil fertility | 0.16# |
| Transition to natural farming is a complex process* | 0.26# |
| I am interested in learning about the potential government incentives for adopting natural farming methods | -1.05 |
| Natural farming practices contributes to the preservation of traditional farming wisdom | 1.32# |
| There is little or no readily available botanical concoctions for plant protection in natural farming* | 0.67# |
| One must have passion towards natural farming to practice it | -0.98 |
| Natural farming leads to better pest and disease management over time | 0.26# |
| Natural farming practices will increase the physical labour and drudgery associated with farming* | 0.18# |
| There is no scientific validation of natural farming practices | -1.00 |
| Natural farming can be economically viable in the long run | 0.70# |
| Natural farming offers a way to reduce reliance on external inputs and resources | 0.77# |
| The productivity of natural farming is enough to meet the ever increasing population | -1.00 |
| Procurement of appropriate raw material is difficult in preparing botanicals* | 0.68# |
| Natural farming empowers women to take on more active roles in agriculture | 0.78# |
| I would not encourage my children to take up natural farming* | 0.85# |
| Natural farming reduces the reliance on synthetic fertilizers and pesticides, which is beneficial for the environment | -0.97 |
| Natural farming leads to consistent and reliable harvest year after year | 0.20# |
| There is little consumer demand for natural farming products* | 0.43# |
| Natural farming produce fetches more price than that of chemical farming | 0.79# |
| I will not encourage fellow farmers to engage in natural farming* | -0.95 |
| Transition to natural farming disrupted my routine which i am not comfortable* | 0.08# |

| Statements | Relevancy (Z value) |
|--|---------------------|
| One can earn more income through natural farming than any other conventional farming methods | 0.12# |
| I am open to investing in training and education related to natural farming | -0.93 |
| There are no proper marketing channels available for natural farming produce* | 0.26# |
| Natural farming builds stronger connections within my local community | 0.13# |
| Most of my fellow farmers are not adopting natural farming which is good in my opinion* | 1.14# |
| Natural farming creates a healthier and safer work environment for myself and my co-workers | 0.88# |
| Integrated farming system is better than adopting natural farming | -0.91 |
| Preparation of biostimulants is a tedious process* | 0.68# |
| Natural farming practices can enhance the fertility and structure of the soil | 0.77# |
| Natural farming addresses some of the challenges faced by modern agriculture | 1.37# |
| Natural farming aligns with my personal values and ethical beliefs about environmental stewardship | -0.85 |
| Natural farming practices require more time and effort than i can commit* | 1.27# |
| Natural farming ensures sustainable and profitable agricultural practices | 1.27# |
| Natural farming helps reduce my carbon footprint and contribute to climate change mitigation | 0.89# |
| Natural farming can be a viable option for commercial crops | 0.82# |
| Natural farming produce is limited to household consumption only* | 0.81# |
| I am motivated to explore innovative ways in practising natural farming | -0.85 |
| I am open to experimenting with different natural farming techniques on my land | 0.74# |
| Natural farming methods have the potential to enhance the water holding capacity of the soil | 0.32# |
| Yields are less compared to conventional farming methods* | 0.22# |
| Natural farming enables crops to withstand the adverse effects of climate change | 0.77# |
| Monetary investment is little when compared to conventional farming method | 0.79# |

*Negative statements, #statements with 'z' values above \bar{z} (0.00)

Table 2. Selection of final attitude statements based on 't' value

| Statements | t-value |
|--|---------|
| Adopting natural farming practices will improve the quality of agricultural produce | 5.96# |
| Natural farming enhances biodiversity on the farm and promotes a healthier ecosystem | 4.81# |
| Natural farming improves the overall health of consumers by providing chemical-free produce | 4.56# |
| There is no strong support from government for natural farming* | 3.70# |
| Natural farming enhances the resilience of my farm in tune with the changing environmental conditions | 3.45# |
| Transitioning to natural farming helps to reduce operational costs in the long run | 2.95# |
| Natural farming is beneficial to only small and marginal farmers* | 2.65# |
| Natural farming mitigates soil erosion and soil degradation besides improving soil fertility | 2.62# |
| Transition to natural farming is a complex process* | 2.46# |
| Natural farming practices contributes to the preservation of traditional farming wisdom | 2.19# |
| There is little or no readily available botanical concoctions for plant protection in natural farming* | 2.14# |
| Natural farming leads to better pest and disease management over time | 2.12# |
| Natural farming practices will increase the physical labour and drudgery associated with farming* | 2.08# |
| Natural farming can be economically viable in the long run | 2.08# |

| Statements | t-value |
|--|---------|
| Natural farming offers a way to reduce reliance on external inputs and resources | 2.02# |
| Procurement of appropriate raw material is difficult in preparing botanicals* | 1.97# |
| Natural farming empowers women to take on more active roles in agriculture | 1.93# |
| I would not encourage my children to take up natural farming* | 1.90# |
| Natural farming leads to consistent and reliable harvest year after year | 1.88# |
| There is little consumer demand for natural farming products* | 1.85# |
| Natural farming produce fetches more price than that of chemical farming | 1.85# |
| Transition to natural farming disrupted my routine which i am not comfortable* | 1.83# |
| One can earn more income through natural farming than any other conventional farming methods | 1.82# |
| There are no proper marketing channels available for natural farming produce* | 1.79# |
| Natural farming builds stronger connections within my local community | 0.77 |
| Most of my fellow farmers are not adopting natural farming which is good in my opinion* | 0.64 |
| Natural farming creates a healthier and safer work environment for myself and my co-workers | 0.50 |
| Preparation of biostimulants is a tedious process* | 0.47 |
| Natural farming practices can enhance the fertility and structure of the soil | 0.26 |
| Natural farming addresses some of the challenges faced by modern agriculture | 0.00 |
| Natural farming practices require more time and effort than i can commit* | 0.00 |
| Natural farming ensures sustainable and profitable agricultural practices | 0.00 |
| Natural farming helps reduce my carbon footprint and contribute to climate change mitigation | 0.00 |
| Natural farming can be a viable option for commercial crops | 0.00 |
| Natural farming produce is limited to household consumption only* | 0.00 |
| I am open to experimenting with different natural farming techniques on my land | 0.00 |
| Natural farming methods have the potential to enhance the water holding capacity of the soil | 0.00 |
| Yields are less compared to conventional farming methods* | 0.00 |
| Natural farming enables crops to withstand the adverse effects of climate change | -0.19 |
| Monetary investment is little when compared to conventional farming method | -1.52 |

*negative statements, #statements with 't' values more than 1.75

Table 3. Final attitude scale to measure attitude of the farmers towards natural farming

| Statements | SA (5) | A (4) | UD (3) | D (2) | SD (1) |
|---|-----------|----------|-----------|----------|-----------|
| Adopting natural farming practices will improve the quality of agricultural produce | | | | | |
| Natural farming enhances biodiversity on the farm and promotes a healthier ecosystem | | | | | |
| Natural farming improves the overall health of consumers by providing chemical-free produce | | | | | |
| There is no strong support from government for natural farming* | | | | | |
| Natural farming enhances the resilience of my farm in tune with the changing environmental conditions | | | | | |
| Transitioning to natural farming helps to reduce operational costs in the long run | | | | | |
| Natural farming is beneficial to only small and marginal farmers* | | | | | |
| Natural farming mitigates soil erosion and soil degradation besides improving soil fertility | | | | | |
| Transition to natural farming is a complex process* | | | | | |
| Natural farming practices contributes to the preservation of traditional farming wisdom | | | | | |

| Statements | SA (5) | A (4) | UD (3) | D (2) | SD (1) |
|--|-----------|----------|-----------|----------|-----------|
| There is little or no readily available botanical concoctions for plant protection in natural farming* | | | | | |
| Natural farming leads to better pest and disease management over time | | | | | |
| Natural farming practices will increase the physical labour and drudgery associated with farming* | | | | | |
| Natural farming can be economically viable in the long run | | | | | |
| Natural farming offers a way to reduce reliance on external inputs and resources | | | | | |
| Procurement of appropriate raw material is difficult in preparing botanicals* | | | | | |
| Natural farming empowers women to take on more active roles in agriculture | | | | | |
| I would not encourage my children to take up natural farming* | | | | | |
| Natural farming leads to consistent and reliable harvest year after year | | | | | |
| There is little consumer demand for natural farming products* | | | | | |
| Natural farming produce fetches more price than that of chemical farming | | | | | |
| Transition to natural farming disrupted my routine which i am not comfortable* | | | | | |
| One can earn more income through natural farming than any other conventional farming methods | | | | | |
| There are no proper marketing channels available for natural farming produce* | | | | | |

*negative statements

3.4 Reliability Test

According to Ray and Mondal [13], Reliability refers to the precision or accuracy of measurement or score. When a scale gives consistently the same results when applied to the same sample, the scale is said to be reliable [14]. The results of the reliability statistics for the constructed attitude scale showed that the split half model reliability coefficient was 0.76, which indicated high internal consistency of the attitude scale constructed for the study. This is most crucial to attitude scale development as it shows the strength of the attitude scale [15].

3.5 Validity Test

The 24 final items were given to 20 judges who were experts in the field of agriculture and natural farming, for their expert guidance in the scale development [16,17]. The suggestions given by the experts were included in the scale and therefore the scale satisfied content validity. Hence, 24 items that satisfied procedural conditions of Likert's summated ratings were selected for the final attitude scale as shown in Table 3.

4. CONCLUSION

The developed Attitude scale has been found to be highly reliable and valid. This standardized scale addresses gap in the literature concerning the assessment of natural farming adoption among farming communities. Furthermore, it will serve as a valuable tool for researchers, extension workers and social organizations engaged in studying natural farming, facilitating further research in this area.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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