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A Scale to Measure Attitude of Farmers Towards Vermiculture Technology

K.I. Pordhiya[1], B.P. Singh[2], Mahesh Chander[3] and Jayant Goyal[4]

1. Assist. Prof., PAH, KU, Khadasali, Gujarat 2. Principal Scientist, 3. Head, Division of Extension Education, ICAR-IVRI, Izatnagar, U.P. 4. Assist. Prof. (Vet.Ext.), BHU, Barkachha, U.P.

Corresponding author e-mail : bpsinghextivri@gmail.com

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ABSTRACT

An attitude scale was constructed to measure the attitude of farmers towards vermiculture technology. Likert's summated rating was followed for the development of the attitude scale. A total of 40 statements were screened after obtaining a relevancy score from expert's judgment and given to vermiculture farmers of the non-sample area of Hamirpur district, Uttar Pradesh. Based upon 't' value obtained for each statement, finally, 16 statements were chosen to have 8 positive and 8 negative statements. The reliability and validity of the scale indicate its precision and consistency of the results. The developed Scale is well suitable to measure the attitude of farmers towards vermiculture technology beyond the study area in the future.

Key words: *Attitude; Farmers; Vermiculture Technology; Reliability & Validity.*

With the blessings of "green revolution" as series of interventions initiated in mid-1960s, Indian agriculture transformed with adoption of modern technology and practices which helps to attain not only self-sufficiency in terms of food grain production but also emerged with a crucial role in food export. High yielding variety seeds, advancement in irrigation facilities, numerous machineries in agriculture activities and use of abundant fertilizers and pesticides supported to increase food production from 83 Mt in 1960-61 to recent estimated production 308.65 Mt for 2020-21 (*GoI, 2020*). Unfortunately, this gradually accompanied positive development carried negative side effects viz. decreased soil fertility, secondary salinity, development of insect resistance to pesticides, increased cost of production which are challenging for future sustainability at high level production and productivity (*Narayanan, 2005*). Increased use of fertilizer dosage per hectare resulted in decrease in incremental yield and, simultaneously soil organic matter depletion is the prime cause on degradation in soil productivity and soil health (*Sharda et al., 2010, Planning Commission, 2010*). Use of vermiculture technology is a sound and viable option in this direction to elevate the soil organic carbon level, soil quality and microbial biomass improvement, increase in water holding capacity and less erosion of the land (*Edwards and Burrows, 1988*). Vermiculture technology deals with scientific process of raising and breeding of earthworms in controlled condition so that organic wastes can easily converted into nutrient rich vermicompost, a fine granular mass. It is also called as Vermicast. To accelerate the use of vermicompost, the organic manure production should increase among the farmers. So, it is essential to catch the attention of farmers towards use of vermiculture technology and encourage them for organic farming. Nutrients losses from animal production in the form of manure are inevitable. Farm yard manure consists of faeces, urine, bedding materials, split feed, split drinking water, and water used for washing the pen. Vermicomposting of the farm yard manure is considered as of the best

techniques for solid biomass waste management (*Nasiru et al., 2013*). Attitude can be defined as the degree of positive or negative effects or feelings associated with some psychological object (*Edwards, 1957*). In the present study attitude was operationalized as the degree of positive or negative feeling of farmers towards vermiculture technology. After literature review, none of the instrument was found suitable to measure the attitude of farmers towards vermiculture technology. Hence, attitude scale was constructed using the following methodology.

METHODOLOGY

Likert method of summated rating (1932) was followed in development of desired scale. A summated rating scale is a set of attitude statements in which all those who have approximately equal attitude value and each of subjects responding with degree of agreement or disagreement carrying different scores. This method is simple, easy to apply and saves time. Besides this, it does not use single statement to represent concept but instead several statements as indicators which represent different facets of concepts and best predictor of actual behaviour.

Item Collection: A set of items/statements which were able to elicit attitude of farmers towards vermiculture technology was collected in consultation with experts and available literature review. A tentative list of 85 statements, consisting of 39 positive and 46 negative statements was listed keeping in both general and specific views of farmers towards vermiculture technology.

Editing the items: Collected statements were cautiously edited by 14 informal criteria, suggested by (*Edwards,1957*). Maximum care was taken in editing the statements so that it could measure what is intended. As a result of this, 12 statements were eliminated and remaining 73 statements were included for further screening.

Relevancy test: All the collected statements may not be equally relevant for measurement of attitude of farmers towards vermiculture technology. So, these statements were scrutinized by expert panel for checking relevancy and final inclusion in the scale. The panel was comprised of experts from concern subject of universities, research and extension institutes. The statements were sent to 127 experts using google form survey, through mail, post and also handed over personally. The judges were requested to examine and to determine each statement relevancy on a three-point continuum *viz.,* most relevant, relevant and not relevant with the score of 3, 2 and 1, respectively and reverse for the negative statements. Out of 127 experts, only 42 responded in a time-span of 45 days. After duly recording their judgments, the statements were considered for the analysis. Relevancy Percentage, Relevancy Weightage and Mean relevancy Score were calculated in following manner.

Relevancy percentage (RP): It is the number of respondents who rated the statements as "most relevant" and "relevant", which was converted into percentage.

$$RP = \frac{FS}{\text{No. of respondents}} \times 100$$

Where,

FS = Frequency score of most relevant and relevant

Relevancy weightage (RW): It is the ratio of actual score obtained to the maximum possible scores obtainable for each statement.

$$RW = \frac{AS}{MPS}$$

Where,

AS = Actual scores obtained for the statement

MPS = Maximum possible scores obtainable for the statement

Mean Relevance Score (MRS): It is the ratio of actual score obtained by each respondent to the number of judges responded for the variable.

$$MRS = \frac{\text{Actual score obtained for item}}{\text{No. of judges responded}}$$

RESULTS AND DISCUSSION

Using above these three criteria, statements were screened for their relevancy. Statements having relevancy percentage >70, relevancy weightage >0.70 and mean relevancy score >2 were considered for final selection of the statements (Table 1). Accordingly, 40 statements were selected and modified suitably and rewritten as per comments obtained by the experts.

Item Analysis: Item analysis is a critical step to construct valid and reliable scale by using Likert's technique. The purpose of item analysis is to select items which can able to discriminate very well between two criterions. The 40 items selected through judge's opinion were administered to a random sample of 30 vermiculture technology adopters from non-sample area. Respondents were asked to respond the statements

on five-point continuum ranging from 'strongly agree', 'agree', 'undecided', 'disagree' and 'strongly disagree' with the scores of 5, 4, 3, 2 and 1, respectively for positive statements and *vice-versa* for negative statements. The total score for each respondent was calculated by summing up scores over all items.

Considering the total score, the respondents were arranged in descending order. The top 25 per cent of respondent with their total scores were considered as the high group and the bottom 25 per cent as the low group. These two groups provide criterion groups in terms of evaluating the separate individual statements as suggested by (*Edwards,1957*). So, 30 adopters of vermiculture technology to whom the items were administered for item analysis, 8 farmers with lowest and 8 with highest scores were used as criterion groups to evaluate individual items. The critical ratio, that is the 't' value measures the extent to which a given statement differentiate between high and low groups of the respondents for individual statements was calculated by using the formula suggested by (*Edward,1957*).

$$t = \frac{X_H - X_L}{\sqrt{\frac{S_H^2}{n_H} + \frac{S_L^2}{n_L}}}$$

Where,

X_H= the mean score on a given statement for the high group

X_L= the mean score on the same statement for the low group

S^2 = the variance of the distribution of responses of high group to the statement

S^2 = the variance of the distribution of responses of low group to the statement

n_L= number of subjects in the high group

n_H= number of subjects in the low group

Final selection of items: As per the thumb rule propounded by (*Edwards,1957*) and (*Edward and Kilpatrick,1948*), rejecting items of poor discriminating ability and questionable validity with 't' value less than 1.75 whereas, statements having highest discriminating ability with 't' value more than 1.75 was retained (Table 2). Following this, only 16 statements (Table 3) were retained in the final scale.

Standardization of scale: The scale developed was further standardized by establishing its reliability and validity.

Reliability: Reliability is the ability of a test instrument to yield consistent results from one set of measures to another. Precisely, reliability is the accuracy or precision of a measuring instrument (*Kerlinger, 1964*).

*Split half method: I*n split half method, the scale was split into two halves of 8 statements each on the basis of odd and even number of statements and administered to the 30 respondents. So, the two sets of scores were obtained. Karl Pearson product moment correlation coefficient was calculated between the two sets of scores obtained. The reliability of the test was 0.74. The 'r' value was significant at one per cent level of significance indicates that present test is reliable to measure attitude of farmers towards vermiculture technology.

Validity: Validity of the research instrument means ability of the instrument what one intended to measure. The develop scale tested for content validity. According to *Kerlinger (1986),* content validity of scale is the representative or sampling adequacy of the content, the substance, the matter and the topics of a measuring instrument. The content validity of the scale was determined through a group of experts. Since the items selected were from the universe of content, it was ensured those items covered the various aspects of attitude of the farmers towards vermiculture technology. Again, the scale value difference for all the statements has a high discriminating value and it seems reasonable to accept the scale as a valid measurement

The statements with 't' values of 1.75 and above (Table 2) were considered for final inclusion. Thus, 8 positive and 8 negative statements with highest values were selected for the final scale (Table 3) as they differentiate between highest and lowest groups.

CONCLUSION

Now a days, use of vermiculture technology as the replacement of fertilizers and plant protection chemicals is on rise among farmers. The preference of farmers practicing vermiculture technology specifically usage in their agriculture field needs to be ascertained. Considering this a scale has been devised to meet these requirements as well as to assess the perception of farming community towards vermiculture technology. The Attitude scale was found to be reliable and valid in measurement of attitude of farmers towards vermiculture technology. Moreover, this scale can be used to measure farmer's attitude for vermiculture technology beyond the study area with suitable modifications.

Table 1. Selection of statements based on judgement of expert panel: Relevancy Percentage (RP), and Relevancy Weightage (RW) score, Most Relevancy Score (MRS)

Statements	RP	RW	MRS
Vermiculture technology can convert waste land into cultivable land.	86.22	89	2.11
Its use can make farmer's field fertile easily.	74.65	0.72	2.64
Vermiculture technology is good option to create entrepreneurship among rural youth.	79.31	0.75	2.03
Vermiculture technology use creates more pollution.*	69.33	0.61	1.98
Family members don't like vermiculture.*	70.36	0.72	2.19
It has less benefits but more propaganda.*	76.55	0.77	2.45
It has high cost of maintenance.*	72.69	0.84	2.21
Vermicompost make crops disease-free.	54.69	0.46	1.69
Vermiculture technology improves productivity of farmers' field.	84.47	0.83	2.65
It has low prestige value.*	79.64	0.77	2.34
Earthworms can easily escape from vermi-beds.*	48.26	0.42	1.03
Farmers feel dirty in handling the vermiculture.*	75.55	0.76	2.09
Farmers can easily earn additional income by using vermiculture technology.	85.77	0.83	2.16
It is the best technology among all composting technologies.	80.21	0.76	2.25
Vermiculture making is time consuming.*	76.69	0.78	2.03
Vermiculture can possible only for large land holders.*	78.51	0.76	2.35
Vermiculture does not add market value to farm produces.*	81.06	0.83	2.19
It can stop use of chemical fertilizers.	75.98	0.79	2.55
Vermiculture technology can give results to few crops.*	67.39	0.63	1.57
It is environment friendly.	73.33	0.75	2.03
It has increased workload of women.*	79.35	0.78	2.40
Market rate of vermicompost is higher than chemical fertilizer.	58.37	0.54	1.15
Rearing earthworm nearby farmer's home, creates unhygienic conditions.*	76.69	0.75	2.71
Vermiculture technology will be never useful for farmers in long run.*	59.33	0.49	1.54
It is such simple that even children can do it.	67.21	0.64	1.69
It is best way to use agricultural wastes.	77.65	0.71	2.39
Making vermiculture is difficult in adverse weather conditions.*	86.47	0.81	2.69
It helps to increase water holding capacity of agriculture land.	71.54	0.76	2.14
It is labour intensive than other techniques of composting.*	74.69	0.81	2.67
It requires proper knowledge and skill through training.	83.25	0.82	2.87
Government does not provide support for vermiculture based enterprise.	69.35	0.64	1.23
Income around the year is not possible from vermiculture technology.*	63.55	0.64	1.69
Vermiculture technology based enterprise is easy to establish.	49.67	0.43	1.57
Vermiculture is easily marketable.	78.54	0.75	2.10
It is foul smelling.*	48.36	0.53	1.35
Farmers can use their leisure time in vermicomposting.	87.25	0.86	2.69
Vermiculture technology is important for promotion of sustainable agriculture.	89.65	0.88	2.73
It is hard to protect earthworms from its natural enemies like birds, ants and rodents.*	76.99	0.79	2.34
Its application can decrease beneficial microorganisms in farmer's field.*	45.98	0.41	1.16
It is only possible by highly educated people.*	57.35	0.59	1.39
Vermiculture technology at farmer's field cannot possible anyhow.*	67.77	0.57	1.41
Vermiculture technology gives quick results.	58.41	0.55	1.19
It is easiest way for promotion of organic farming.	84.68	0.81	2.52
Its application in agriculture should be stopped as early as possible.*	69.35	0.60	1.98
It is necessary to add nutrients along with vermicompost as it contain very less.*	49.65	0.45	1.90
It is not useful where more chemical fertilizers are already in use at farmer's field.*	47.56	0.49	1.24
Vermiculture technology is costly and less beneficial.*	69.25	0.59	1.49
It should be popularised among farmers for promotion of organic agriculture.	55.26	0.54	1.57

It is not suitable for agro-climatic zone where more fluctuation in temperature.*	79.22	0.78	2.36
It can be a subsidiary occupation to farmers.	73.66	0.72	2.05
Knowledge about appropriate raw materials is much needed.	59.65	0.54	1.24
Less cost vermiculture technology is only dream of government.*	78.64	0.79	2.35
Its long term use at farmer's field can reduce soil health status.*	67.77	0.64	1.21
Only skilled person can do it.*	84.35	0.82	2.46
Raw materials for vermiculture are easily available.	89.24	0.85	2.39
It helps to improve quality and quantity of farm produces.	83.41	0.81	2.44
It can uplift socioeconomic status of poor farmers.	76.35	0.75	2.37
It is a feasible enterprise for the empowerment of farm women.	72.63	0.71	2.22
It does not increase soil moisture contents of the soil.*	59.65	0.61	1.82
Transportation of earthworms is difficult.*	54.22	0.52	1.61
It can reduce pesticide use at farmer's field.	87.64	0.85	2.81
Its application increases pest infestation on plants.*	69.03	0.59	1.98
Its application decreases plant growth and yield.*	72.59	0.70	2.35
It is a rapid compost making method than conventional composting.	74.66	0.79	2.48
It requires more land use for preparation.*	78.36	0.74	2.09
It has self-employment opportunity for both men and women.	82.84	0.80	2.58
It is capable for land resource management.	64.65	0.66	1.69
Its application induce soil toxicity.*	59.09	0.54	1.49
It has potential to reduce migration of rural youths.	57.93	0.50	1.39
It improves plant root growth and structure.	87.32	0.85	2.68
Vermicompost is easy to use than chemical fertilizers.	49.88	0.57	1.69
It is more profitable than chemical fertilizers.	59.22	0.55	1.24
Productivity of crops per hectare is lower than chemical fertilizers.*	92.61	0.94	2.69

*Negative statements

Table 2. Statements with t value

Statements	't' value
Vermiculture does not add market value to farm produces	3.69
Raw materials for vermiculture are easily available	2.36
It has less benefits but more propaganda	1.44
It is labour intensive than other techniques of composting	3.69
It has low prestige value	1.93
It can stop use of chemical fertilizers	2.63
It requires more land use for preparation	1.56
Vermiculture making is time consuming	1.98
It is a feasible enterprise for the empowerment of farm women	2.19
It is a rapid compost making method than conventional composting	2.16
Rearing earthworm nearby farmer's home, creates unhygienic conditions	1.49
Its application decreases plant growth and yield	1.45
Vermiculture technology improves productivity of farmers' field	3.65
It is not suitable for agro-climatic zone where more fluctuation in temperature	1.74
It requires proper knowledge and skill through training	4.01
Less cost vermiculture technology is only dream of govt .	1.36
Family members don't like vermiculture	1.69
It is easiest way for promotion of organic farming	3.25
It has high cost of maintenance	2.99
It helps to improve quality and quantity of farm produces	1.69
It has increased workload of women	1.66
It improves plant root growth and structure	3.44
It is hard to protect earthworms from its natural enemies like birds, ants and rodents	2.54
Vermiculture technology is good option to create entrepreneurship among rural youth	1.65
Making vermiculture is difficult in adverse weather conditions	3.78
Only skilled person can do it	2.75
It is environment friendly	1.59
Vermiculture can possible only for large land holders	3.95
Farmers feel dirty in handling the vermiculture	1.64
Productivity of crops per hectare is lower than chemical fertilizers	3.24
It can uplift socioeconomic status of poor farmers	2.64
It should be popularised among farmers for promotion of organic agriculture	2.70
It can be a subsidiary occupation to farmers	1.24
It can reduce pesticide use at farmer's field	4.10
It has self-employment opportunity for both men and women	3.64
It is the best technology among all composting technologies	1.45
Farmers can easily earn additional income by using vermiculture technology	3.08
Its use can make farmer's field fertile easily	2.01
Vermiculture technology is important for promotion of sustainable agriculture	3.65
It is best way to use agricultural wastes	1.63

Table 3. Statements selected for inclusion in the final scale

Statements	SA	A	UD	DA	SDA
It can reduce pesticide use at farmer's field					
It has self-employment opportunity for both men and women					
Productivity of crops per hectare is lower than chemical fertilizers*					
It improves plant root growth and structure					
It is labour intensive than other techniques of composting *					
It is hard to protect earthworms from its natural enemies like birds, ants and rodents*					
Vermiculture can possible only for large land holders*					
It requires proper knowledge and skill through training					
Only skilled person can do it*					
Vermiculture technology is important for promotion of sustainable agriculture					
It is easiest way for promotion of organic farming					
It has high cost of maintenance*					
Vermiculture technology improves productivity of farmers' field					
Farmers can easily earn additional income by using vermiculture technology					
Vermiculture does not add market value to farm produces*					
Making vermiculture is difficult in adverse weather conditions*					

*Negative statements; SA: Strongly agree, A: Agree, UD: Undecided, DA: Disagree, SDA: Strongly disagree.

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CONFLICTS OF INTEREST

The authors declare that they have no conflicts of interest.

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