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Scale to Measure Performance of Extension Personnel in Promoting Sustainable Dry Farming

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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

The scale was developed to measure the performance level of extension personnel in promoting sustainable dry farming in central dry zone of Karnataka. Dry farming areas are the areas which receives an annual rainfall of 750 mm or less than that and there is no irrigation facility for raising crops. Dry farming is the scientific management of soil and crops under dry lands without irrigation. In total 38 statements were framed in scale with review of literature, experts' suggestion and the role & responsibilities prescribed by State Department of Agriculture, Karnataka to their staff. The edited statements in form of questionnaires were sent to 109 judges to rate the relevancy of statements with the help of online platform 'Google Forms'. Out of 109, 21 completely filled questionnaires were received in the span of 3 months with many reminders through mail and phone calls. In total 20 statements were selected out of 38 which were having mean relevancy score more than 4.00 and relevancy percentage more than 80. Then t-test has been administered for item analysis and all the 20 selected statements were found to have t-value more than the standard value i.e., 1.75 and hence all 20 statements were retained to the final scale. The r-value was found to be 0.78 and hence the scale was found to be reliable and valid to use in future for the similar investigations.

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1. INTRODUCTION

Enormous use of chemical inputs led to decrease in production efficiency of natural resources with the signs of new problems like degradation and pollution [1]. The irrigated lands got exhausted due to the intensive agricultural practices whereas, the dry lands were not utilised up to the mark due to the prevailing extensive agricultural practices. One fourth (25.00 %) of the world's total cultivable land is dry land. That to 72.00 per cent of the total dry land of the world is available in developing countries. Even though productivity of dry lands are less, their contribution to the food production is not negligible due to their vast area [2]. Dry farming areas are the areas which receives an annual rainfall of 750 mm or less than that and there is no irrigation facility for raising crops. It is the scientific management of soil and crops under dry lands without irrigation. Almost half (49.00 %) of the land in India is under dry farming condition [2].

Hence it's high time to utilise the neglected dry lands in an efficient and sustainable way to feed the fast growing population. The sustainability commence to gain more and more importance as the need of food security achieved in the production of food grains. Any concept/technology need promotional efforts in order to reach the farmers. This effort usually made by many public and private agencies. State agricultural department is one such public agency which is constantly making efforts to bring desirable changes in the lives of the farming community and to gradually improve their farm income [3]. Hence to understand the promotional efforts of these agencies on a particular technology/innovation, there is requirement of a tool to quantify it. As the performance of an individual is a qualitative parameter, this scale was developed as a tool quantify the level of performance of extension personnel in promoting sustainable dry farming in central dry zone of Karnataka.

2. METHODOLOGY

Five point continuum scale was developed to measure the performance level of extension personnel with respect to their promotional efforts of sustainable dry farming. The summated rating method suggested by Likert [4] and Edwards [5] was utilised to develop this scale. The different steps followed while developing the scale. In the first step the identification of different dimensions of sustainable dry farming and the activities to be performed to promote sustainable dry farming were identified thoroughly. The different activities which need to be performed by the extension personnel to promote sustainable dry farming were listed. To identify the activities the literatures were studied, experts' advices were taken and also the roles and responsibilities of the extension personnel prescribed by the State Department of Agriculture for various hierarchical level were considered. In the next steps the collection and editing of items/statements was done.

There was 38 statements which define the identified works to be carry out to promote sustainable dry farming were framed. The statements were edited with utmost care by considering the 14 criteria suggested by Edwads [5] and Thurstone and Chave [6].

3. RESULTS

3.1 Relevancy Test

The framed statements were sent to the 109 judges (who were assistant professors, subject matter specialists and scientists in the department of agronomy at different agricultural universities, Krishi Vigyan Kendras and research stations) across the country. The questionnaire was prepared, sent and responses were collected with the help of an online platform 'Google Forms' by providing necessary instructions. The statements were provided with five point continuum *viz.,* highly relevant (HR), more relevant (MR), relevant (R), irrelevant (IR) and most irrelevant (MIR) with the score weightage 5,4,3,2 and 1 respectively. In total, we received 21 completely filled questionnaires from 21 judges. Further proceeded towards item analysis as follows.

3.2 Selection of Items

The selection of item was made by calculating the Relevancy Percentage (RP) and Mean Relevancy Scores (MRS) to each statement by taking judges responses as criteria. The calculations were done using the formula given below:

$$\text{Relevancy Percentage (RP)} = \frac{(\text{HR} \times 5 + \text{MR} \times 4 + \text{R} \times 3 + \text{IR} \times 2 + \text{MIR} \times 1)}{\text{Maximum possible score}} \times 100$$

$$\text{Mean Relevancy Score (MRS)} = \frac{(\text{HR} \times 5 + \text{MR} \times 4 + \text{R} \times 3 + \text{IR} \times 2 + \text{MIR} \times 1)}{\text{Total no. of judges}}$$

Where,

HR= Highly Relevant
MR= More Relevant
R= Relevant
IR= Irrelevant
MIR= Most irrelevant

The statements with Relevancy Percentage (RP) more than 80.00 and the Mean Relevancy Score (MRS) more than 4.00 were selected. In total 20 statements were selected and the further item analysis was done.

3.3 Item Analysis

Item analysis and the scale preparation was done with the 20 selected statements. The responses were collected by interviewing 20 extension personnel in the non-sampled area. The total score for each statements was calculated and the scores were kept in a descending order. The t-test was administered to each statement by considering top 25 percent (highest scores) and bottom 25 per cent (lowest scores) as criterion groups. All 20 selected statements were found to have t-value more than 1.75 and hence no statement was rejected. The t-values were calculated by using the formula given below:

$$t = \frac{\overline{X}_H - \overline{X}_L}{\sqrt{\frac{\left(\sum \overline{X}_H^2 - \frac{(\sum \overline{X}_H)^2}{n}\right) \times \left(\sum \overline{X}_L^2 - \frac{(\sum \overline{X}_L)^2}{n}\right)}{n(n-1)}}}$$

Where,

$\overline{X}_H$ = Individual scores in the high group
$\overline{X}_L$ = Individual scores in the low group
n = Number of respondents

3.4 Validity of the Scale

The content validity was confirmed by framing the statements with valid sources by review of literature and the experts' opinion. Also the relevancy of each statements was confirmed by taking judges relevancy ratings. Hence this performance scale was proved to be valid to measure the performance level of extension personnel in promoting sustainable dry farming.

3.5 Reliability of the Scale (Split-Half Reliability)

Reliability of the scale was confirmed by administering the split-half test. 20 respondents were divided into odd and even groups with 10 members in each group. The correlation was done between odd and even group scores and the correlation coefficient (r) value was found to be 0.78. The value was more than standard value i.e., 0.70. Hence this constructed scale was statistically proved to be reliable to measure the performance level of extension personnel with respect to the promotion of sustainable dry farming.

3.6 Method of Scoring

The scale consists of 20 statements with a five point continuum response categories that respondent need to give their responses. The statements about the activities to be performed by the extension personnel to promote sustainable dry farming were framed. The score weightages 4, 3, 2, 1 and 0 were assigned to the response categories 'more frequently done', 'frequently done', 'moderately done', 'rarely done' and 'never done' respectively. Higher score indicates better performance level and lower

Table 1. Distribution of extension personnel as per their level of performance in promoting sustainable dry farming practices

Sl. No.	Category		Class interval (scores)
1	Low	(< Mean – SD)	< 56
2	Medium	(Mean ± SD)	56 - 68
3	High	(> Mean + SD)	> 68
Mean			62
Standard deviation			6

score indicates poor performance level. The highest and lowest possible scores that could be obtained from this scale were 80 and 0 respectively. The highest and lowest scores obtained from the data set were 78 and 44 respectively.

4. CONCLUSION

This standardised performance scale is to measure the performance level of the respondents in promoting sustainable dry farming. The scale might be useful to measure the same qualitative parameter of the similar respondents in the similar field conditions. The authors have published this article without any competing interests.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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APPENDICES

Appendix I. Calculated mean relevancy scores (MRSs) and Relevancy Percentages (RP) of Performance scale

Sl. No.	Statements	MRS	RP
1	Creation of awareness among farming community about the importance of sustainability of soil.	4.38	87.62
2	Monitoring and implementation of soil health programmes.	4.38	87.62
3	Awareness creation and providing proper facility for soil testing.	4.38	87.62
4	Promotion and implementation of soil health cards.	4.10	81.90
5	Promotion of diversified cropping systems and awareness creation about its benefits.	4.24	84.76
6	Collection of field information of crop damage due to long dry spells.	4.10	81.90
7	Demonstrations regarding seed hardening and creation of awareness of its benefits.	3.81	76.19
8	Preparation of contingency cropping plans for probable weather variations and their implementation at right time.	4.24	84.76
9	Promotion of Integrated Nutrient Management practices appropriate to dry farming conditions.	4.24	84.76
10	Creation of awareness about judicious use of fertilizers.	4.00	80.00
11	Awareness creation, promotion and supply (as per demand) of bio fertilizers suitable to dry farming crops.	3.86	77.14
12	Demonstrations regarding seed treatment of bio inoculants.	3.90	78.10
13	Awareness creation and promotion of vermicomposting.	4.05	80.95
14	Awareness creation about green manures and green leaf manures.	3.90	78.10
15	Promotion of Integrated Pest Management practices appropriate to dry farming conditions.	3.67	73.33
16	Awareness creation, promotion of use of beneficial insects.	3.43	68.57
17	Awareness creation, promotion and supply (as per demand) of bio control agents suitable to dry farming situation.	3.43	68.57
18	Promotion of in-situ moisture conservation practices.	4.38	87.62
19	Awareness creation, promotion of drip irrigation system for protective irrigation.	4.05	80.95
20	Provision of subsidies and proper technical supports for drip irrigation.	3.90	78.10
21	Awareness creation and Promotion of farm ponds.	4.19	83.81
22	Awareness creation about depleting ground water.	4.05	80.95
23	Promotion of ground water recharging techniques.	4.00	80.00
24	Promotion of agroforestry systems suitable under dry farming conditions.	3.76	75.24
25	Providing the forest trees saplings (in collaboration with forest department) to farmers.	3.71	74.29
26	Creation of awareness about adverse effects of overuse of synthetic agro chemicals.	3.76	75.24
27	Community level awareness creation about water shed development and it benefits.	4.05	80.95
28	Use of MGNREGA man-days in water shed development activities.	4.05	80.95
29	Creation of awareness about the importance and benefits of bio-diversity.	3.81	76.19
30	Promotional efforts and support to the newly arriving nature friendly inputs over harmful one.	3.90	78.10

31	Training programmes and workshops to promote sustainable dry farming practices.	4.05	80.95
32	Strict quality control measures of agricultural inputs w.r.t. environmental safety and their timely availability.	3.86	77.14
33	Monitoring of proper implementation of sustainable dry farming practices.	4.19	83.81
34	Providing technical assistance to field staff about the sustainable dry farming practices.	4.33	86.67
35	Proper monitoring, evaluation of implemented sustainable dry farming programmes and reconsideration if necessary.	4.24	84.76
36	Preparation of action plan with more preference to sustainable dry farming practices.	3.95	79.05
37	Convincing farmers about benefits of sustainable dry farming in its long term.	4.14	82.86
38	Promoting and supplying the insect traps.	3.67	73.33

{Items with MRS more than 4.00 were selected (not the items with MRS more than and equivalent to 4.00) means the items with MRS 4.00 were also rejected.}

Appendix II. Calculated discrimination indexes (t values) of selected statements of Performance scale

Sl. No.	Selected statements based on MRS value	t values
1	Creation of awareness among farming community about the importance of sustainability of soil.	2.78
2	Monitoring and implementation of soil health programmes.	2.36
3	Emphasizing and providing proper facility for soil testing.	2.31
4	Promotion and implementation of soil health cards.	2.31
5	Stimulating diversified cropping systems and awareness creation about its benefits.	2.45
6	Preparation of contingency cropping plans for probable weather variations and their implementation at right time.	2.36
7	Promotion of Integrated Nutrient Management practices appropriate to dry farming conditions.	2.36
8	Giving emphasis to vermicomposting.	2.45
9	Encouraging in-situ moisture conservation practices.	2.31
10	Boosting up of drip irrigation system for protective irrigations.	2.78
11	Stimulating use of farm ponds.	2.31
12	Awareness creation about depleting ground water.	2.31
13	Educating about water shed development and it benefits at Community level.	2.31
14	Use of MGNREGA man-days in water shed development activities.	2.31
15	Training programmes and workshops to encourage sustainable dry farming practices.	2.31
16	Monitoring of proper implementation of sustainable dry farming practices.	2.45
17	Providing technical assistance to field staff about the sustainable dry farming practices.	2.36
18	Proper monitoring, evaluation of implemented sustainable dry farming programmes and reconsideration if necessary.	2.31
19	Convincing farmers about benefits of sustainable dry farming in its long term.	2.36
20	Collection of field information of crop damage due to long dry spells.	2.45

Appendix III. Standardized performance scale to measure performance level of extension personnel in promoting sustainable dry farming practices

Sl. No.	Statements	Response categories				
		MF	F	M	R	N
1	Creation of awareness among farming community about the importance of sustainability of soil.					
2	Monitoring and implementation of soil health programmes.					
3	Emphasising and providing proper facility for soil testing.					
4	Promotion and implementation of soil health cards.					
5	Stimulating diversified cropping systems and awareness creation about its benefits.					
6	Preparation of contingency cropping plans for probable weather variations and their implementation at right time.					
7	Promotion of Integrated Nutrient Management practices appropriate to dry farming conditions.					
8	Giving emphasis to vermicomposting.					
9	Encouraging in-situ moisture conservation practices.					
10	Boosting up of drip irrigation system for protective irrigations.					
11	Stimulating use of farm ponds.					
12	Awareness creation about depleting ground water.					
13	Educating about water shed development and it benefits at Community level.					
14	Use of MGNREGA man-days in water shed development activities.					
15	Training programmes and workshops to encourage sustainable dry farming practices.					
16	Monitoring of proper implementation of sustainable dry farming practices.					
17	Providing technical assistance to field staff about the sustainable dry farming practices.					
18	Proper monitoring, evaluation of implemented sustainable dry farming programmes and reconsideration if necessary.					
19	Convincing farmers about benefits of sustainable dry farming in its long term.					
20	Collection of field information of crop damage due to long dry spells.					

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