Journal of Pharmacognosy and Phytochemistry

Available online at www.phytojournal.com

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Construction of scale to measure impact of mobile based agro advisory services

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Abstract
The failure of the various extension delivery methods in India to effectively cater significant and sustainable agricultural growth has become a major concern to all stakeholders, including the funding agencies and Government. The centre of these challenges, extension community is grappling with the question of how best to harness technology dissemination system of State Department of Agriculture to benefit the farmers. There was no scale available to measure impact of mobile based agro advisory services of state department of Agriculture. The present study was contemplated to develop and standardize the same. Out of 50 statements, 30 statements were retained on the final scale. The reliability (0.844) and validity of the scale indicates its precision and consistency of the results. This scale can be used to measure impact of mobile based agro advisory services beyond the study area with suitable modifications.

Keywords: Impact, mobile based agro advisory services, state department of agriculture etc

Introduction

In the last few decades, information and communication technologies (ICTs) have provided immense opportunities for the social and economic development of rural people, and some technologies have surpassed others. Mobile telephony is one such technology that has developed significantly in the past few years, and the subscription rate in developing countries has gone up from 22 per 100 inhabitants in 2005 to 91.8 per 100 inhabitants in 2015. Mobile technology goes beyond geographic, socioeconomic, and cultural barriers and this large increase in mobile subscriptions, along with the recent roll out of 3G and 4G technology, can play a big role in the development of rural people. Mobile phones are devices that can create, store, access, and share information anytime, anywhere. But they are more than that. When teamed with extension and advisory services, they can help improve the livelihoods of rural people by getting much needed timely information to their fingertips at potentially low cost. So-called mobile-based extension and advisory services enable value-added services, such as mobile agro-services and machine to machine services, which help farmers monitor their crops and farm machinery through mobile phones. While value-added services are generally fairly accessible to all the farmers in rural areas, machine-to-machine services are more cost intensive and require infrastructure that is often not present in developing countries (Sarvanan and Bhattacharjee, 2015) [8]. SMS Portal for Farmers has empowered all Central and State Government Organizations in Agriculture & Allied sectors (including State Agriculture Universities, Krishi Vigyan Kendras, Agromet Forecasts Units of India Meteorological Department, ICAR Institutes, Organization in Animal Husbandry, Dairying & Fisheries etc.) to give information/services/advisories to farmers by SMS in their language, preference of agricultural practices and locations. To put it succinctly, almost every Government Department, Office and Organisation from the Ministry Headquarters down to the level of Block having anything to do with agriculture and allied sectors in every nook and corner of the country has been authorised to use this Portal to provide information to farmers on vast gamut of issues. USSD (Unstructured Supplementary Service Data), IVRS (Interactive Voice Response System) and Pull SMS are value added services which have enabled farmers and other stakeholders not only to receive broadcast messages but also to get web based services on their mobile without having internet. Semi-literate and illiterate farmers are also targeted to be reached by voice messages. Hence it was necessary to develop and standardize the scale to measure the impact of these mobile based agro advisory services.

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Methodology

A scale was specially developed to measure Impact of Mobile based Agro Advisory Services. The method of summated rating suggested by Rensis Likert (1932) [4] and Edwards (1957) [1] was followed in construction of the scale.

1. Collection and editing of items

Fifty statements, expressing the impact of mobile based agro advisory services by state department of agriculture on farmers have been collected from available literature, websites and in consultation with the specialists in the field of extension and they were edited on the basis of criteria suggested by Thurstone (1946), Likert (1932) [4] and Edward (1957) [1]. Out of 50 statements, 45 statements were retained after editing. These statements were found to be non ambiguous and non-factual.

2. Relevancy test

The list of 45 statements, so selected, was sent to 101 judges which are senior faculty members in the disciplines of Agricultural Extension from the State Agricultural Universities, programme coordinator and Subject Matter Specialists of the Krishi Vigyan Kendras, Extension Scientists from the ICAR institutes. They were requested to indicate their responses about each of the statements on a three point continuum namely, 'most relevant' 'relevant' and 'not relevant' with the score of 3, 2, and 1, respectively. So also, their opinion about inclusion of the statements in the final scale was sought. A total of 67 judges responded to the appeal and returned the duly filled in schedules. On the basis of the responses received, the relevancy weightage, relevancy percentage and mean relevancy score for each statement were worked out by using the following formulae.

i. Relevancy weightage

Following formula was used to work out the relevancy weightage of a statement.

$$RW = \frac{MRR \times 3 + RR \times 2 + NRR \times 1}{MOS \ (3 \times 67 = 201)}$$

Where,
RW = Relevancy Weightage
MRR = Most Relevant Response
RR = Relevant Response
MOS = Maximum Obtainable Score

ii. Relevancy Percentage

Relevancy percentage of each statement was computed by using the following formula.

$$RP = \frac{OS}{MOS \ (3 \times 67 = 201)} \times 100$$

Where,
RP = Relevancy Percentage
OS = Obtained Score
MOS = Maximum Obtainable Score.

iii. Mean Relevancy Score

For calculating the mean relevancy score of each item, following formula was used.

$$MRS = \frac{MRR \times 3 + RR \times 2 + NRR \times 1}{No. \ of \ Judges \ (67)}$$

Where,
MRS = Mean Relevancy Score
MRR = Most Relevant Response
RR = Relevant Response
NRR = Not Relevant Response

Using these three criteria, the items were screened for their relevancy. Finally, the statements having, more than 0.66 relevancy weightage, more than 66.00 per cent relevancy percentage and more than 2 mean relevancy score were considered relevant to assess the perception. Accordingly, 42 statements were selected.

Table 1: Relevancy Weightage, Relevancy Percentage and Mean Relevancy Score

S. No.	Statements	RW	RP	MRS
A)	**Impact of Agricultural Information**			
1)	Better seasonal crop management is possible due to the mobile based agro advisory services	0.9203	92.03	2.76
2)	Critical inputs can be optimally used by the farmer due to the guidance received through MBAS	0.8656	86.56	2.59
3)	MBAS helps farmer in proper insect pest and disease management	0.8855	88.55	2.65
4)	Weed management can be done on time with the help of MBAS	0.7114	71.14	2.13
5)	Information about livestock management helps the farmer to take care of his livestock	0.8308	83.08	2.49
6)	Dairy related information helps the farmer for raising the milch animals and setting up dairy enterprise	0.7810	78.10	2.34
7)	Modern farm implements, tools can be used in the field with proper guidance	0.7363	73.63	2.20
8)	Farm mechanization is promoted due to MBAS	0.6965	69.65	2.08
9)	Farm operations like sowing, harvesting, marketing etc. can be performed well on time with the help of technical guidance	0.8756	87.56	2.62
10)	Farmer can shift the cropping pattern with the help of weather advisory services	0.8457	84.57	2.53
11)	Timely pest and disease forecasting leads to proper crop protection measures	0.8805	88.05	2.64
12)	Weather advisory helps in proper management of transportation of farm produce for distant market	0.7462	74.62	2.23
13	Credit information provided through mobile advisories helps the farmers financially (Deleted due to repetition)	0.7263	72.63	2.17
14	Sometimes technical information is too technical to understand by the farmers	0.6512	65.12	1.95
15	Mobile network may not work better during decisive period of farm operation in village	0.6417	64.17	1.92
B)	**Impact of Market information**			
1)	MBAS provides all the market prices of the different farm produce to the farmers	0.7960	79.60	2.38
2)	Advisories related to livestock market helps the farmer for getting higher profits in livestock trading (Deleted due to repetition)	0.8059	80.59	2.41

3)	The farmer can select better market for their produce due to MBAS (Deleted due to repetition)	0.7611	76.11	2.28
4)	MBAS provides better opportunity for purchasing quality inputs at fair prices	0.7611	76.11	2.28
5)	MBAS provides the MSP of different agricultural commodities to the farmers	0.8706	87.06	2.61
6)	Farmers become aware about the malpractices at the market yard due to MBAS	0.8507	85.07	2.55
7)	Agricultural Input prices and their availability etc information is also provided through MBAS	0.7363	73.63	2.20
8)	Farmers are well aware about the malpractices at the market yard due to agro advisories	0.6716	67.16	2.01
9)	Agricultural Input prices and their availability etc information is also provided through mobile agro advisory services	0.7164	71.64	2.14
C)	**Psychological Impact**			
1)	MBAS facilitates decision making of farmers about various agricultural operations	0.9004	90.04	2.70
2)	Farmers get motivated to visit the research system willingly for seeking detailed information on new technologies	0.7661	76.61	2.29
3)	MBAS motivates the farmers to adopt agricultural technologies	0.8706	87.06	2.61
4)	MBAS improves farmers ability to negotiate with the trader about prices of their produce	0.7960	79.60	2.38
5)	MBAS strengthens conversation about farming practices among the farmers	0.6915	69.15	2.07
6)	MBAS enhances the risk taking ability of farmers	0.7711	77.11	2.31
7)	MBAS make farmers psychologically strong for facing new challenges	0.7014	70.14	2.10
8)	Lack of self confidence in handling mobile phone can adversely affect psychological domain of farmer	0.6567	65.67	1.97
9)	Ignorance about mobile agro advisory cannot provoke them for its practical application	0.6567	65.67	1.97
D)	**Social Impact**			
1)	MBAS improves the social relationship of the farmers	0.6666	66.66	2.0
2)	MBAS raises standard of living of the farmer and his family	0.7064	70.64	2.11
3)	MBAS increases the involvement of farmers in social activities	0.7960	79.60	2.38
4)	The technical guidance through mobile phone improves the social and economic status of the farmer.	0.8009	80.09	2.40
5)	Higher social involvement can be achieved by participating in the Agril. Exhibitions, Agro expositions, Agril. Tour, field tour etc.	0.7412	74.12	2.22
6)	Social participation increases due to the knowledge gained through MBAS	0.8009	80.09	2.40
7)	Better crop management practices can be adopted by the farmers with the help of timely guidance through mobile based agro advisory services (Deleted due to repetition)	0.7164	71.64	2.14
8)	Practical application of mobile based agro advisory can be affected lot by farmers social behaviour	0.7213	72.13	2.16
E)	**Economic Impact**			
1)	MBAS helps the farmers to stand tall with better economic returns	0.7313	73.13	2.19
2)	MBAS help farmers in effective planning of plant protection measures	0.8905	89.05	2.67
3)	MBAS reduces frequency of sprays in crops	0.8507	85.07	2.55
4)	Proper technical guidance through MBAS lessen economic burden of farmers	0.7462	74.62	2.23
5)	Farmer can fetch better prices for their produce due to MBAS	0.7512	75.12	2.25
6)	Weather advisory delivered through MBAS can avert crop losses	0.8457	84.57	2.53
7)	Proper input management reduces economic losses of the farmers	0.8756	87.56	2.62
8)	Proper irrigation management reduces economic issues of farmers	0.8258	82.58	2.47
9)	MBAS can help in better economic returns which results in uplifting the standard of living of the farmers	0.8507	85.07	2.55

3. Calculation of 't' value (Item analysis)

These 45 statements were subjected to item analysis to delineate the items based on the extent to which they can differentiate the respondent with high impact than the respondent with low impact of mobile based agro advisory services of State Department of Agriculture in Marathwada region. For this 40 farmers were selected from non-sample area. The respondents were asked to indicate their degree of agreement or disagreement with each statement on the five-point continuum ranging from "strongly agree" to "strongly disagree". The scoring pattern adopted was 4 to 0, in which, 4 weighs to strongly agree response, 3 to agree response, 2 to undecided response, 1 to disagree response and 0 to strongly disagree response for positive statement and for negative statement, the scoring pattern was reversed. Based upon the total scores, the respondents were arranged in descending order. The top 25 per cent of the respondents with their total scores were considered as the high group and the bottom 25 per cent as the low group, so as these two groups provide criterion groups in terms of evaluating the individual statements as suggested by Edwards (1957) [1]. Thus out of 40 farmers to whom the items were administered for the item analysis, 15 farmers with lowest, 15 with highest scores were used as criterion groups to evaluate individual items.

The critical ratio, that is the 't' value which is a measure of the extent to which a given statement differentiates between the high and low groups of the respondents for each statements was calculated by using the formula suggested by Edward (1957) [1].

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

Where,

"$(X_H - X_H)^2$ = "$X_H{}^2$ – ("X_H)^2

"$(X_L - X_L)^2$ = "X_L2 – ("X_L)^2

X_H = The mean score on given statement of the high group

X_L = The mean score on given statement of the low group

$X_H{}^2$ = Sum of squares of the individual score on a given statement for high group

$X_L{}^2$ = Sum of squares of the individual score on a given statement for low group

X_H = Summation of scores on given statement for high group

X_L = Summation of scores on given statement for low group

n = Number of respondents in each group

Σ = Summation

4. Selection of Statements for final scale

After computing the 't' value for all the 45 items, statements with greater than 1.75 and highest 't' value were finally selected for inclusion in scale. The list of statements and their 't' values are shown in following table.

Table 1: List of total statements of scale with their 't' values

S. No	Statements	SA	A	UD	DA	SDA	't' Value
A	**Impact of Agricultural Information**						
1.	Better seasonal crop management is possible due to the mobile based agro advisory services						2.80
2.	Critical inputs can be optimally used by the farmer due to the guidance received through MBAS						3.52
3.	MBAS helps farmer in proper insect pest and disease management						4.00
4.	Weed management can be done on time with the help of MBAS						-1.68
5.	Information about livestock management helps the farmer to take care of his livestock						0.38
6.	Dairy related information helps the farmer for raising the milch animals and setting up dairy enterprise						2.06
7.	Modern farm implements, tools can be used in the field with proper guidance						0.38
8.	Farm mechanization is promoted due to MBAS						2.10
9.	Farm operations like sowing, harvesting, marketing etc. can be performed well on time with the help of technical guidance						3.06
10.	Farmer can shift the cropping pattern with the help of weather advisory services						2.43
11.	Timely pest and disease forecasting leads to proper crop protection measures						1.81
12.	Weather advisory helps in proper management of transportation of farm produce for distant market						-3.87
B	**Impact of Market information**						
1.	MBAS provides all the market prices of the different farm produce to the farmers						2.84
2.	Advisories related to livestock market helps the farmer for getting higher profits in livestock trading						3.15
3.	The farmer can select better market for their produce due to MBAS						3.44
4.	MBAS provides better opportunity for purchasing quality inputs at fair prices						2.12
5.	MBAS provides the MSP of different agricultural commodities to the farmers						0.00
6.	Farmers become aware about the malpractices at the market yard due to MBAS						2.77
7.	Agricultural Input prices and their availability etc information is also provided through MBAS						-6.42
C	**Psychological Impact**						
1.	MBAS facilitates decision making of farmers about various agricultural operations						2.20
2.	Farmers get motivated to visit the research system willingly for seeking detailed information on new technologies						4.37
3.	MBAS motivates the farmers to adopt agricultural technologies						-2.10
4.	MBAS improves farmers ability to negotiate with the trader about prices of their produce						4.18
5.	MBAS strengthens conversation about farming practices among the farmers						3.44
6.	MBAS enhances the risk taking ability of farmers						0.52
7.	MBAS make farmers psychologically strong for facing new challenges						3.10
D	**Social Impact**						
1.	MBAS improves the social relationship of the farmers						2.58
2.	MBAS raises standard of living of the farmer and his family						1.16
3.	MBAS increases the involvement of farmers in social activities						2.13
4.	The technical guidance through mobile phone improves the social and economic status of the farmer.						3.84
5.	Higher social involvement can be achieved by participating in the Agril. Exhibitions, Agro expositions, Agril. Tour, field tour etc.						2.47
6.	Social participation increases due to the knowledge gained through MBAS						2.34
7.	Practical application of mobile based agro advisory affects social behaviour of the farmers						1.87
E	**Economic Impact**						
1.	MBAS helps the farmers to stand tall with better economic returns						1.33
2.	MBAS help farmers in effective planning of plant protection measures						3.75
3.	MBAS reduces frequency of sprays in crops						6.29
4.	Proper technical guidance through MBAS lessen economic burden of farmers						0.41
5.	Farmer can fetch better prices for their produce due to MBAS						3.53
6.	Weather advisory delivered through MBAS can avert crop losses						4.00
7.	Proper input management reduces economic losses of the farmers						2.50
8.	Proper irrigation management reduces economic issues of farmers						2.10
9.	MBAS can help in better economic returns which results in uplifting the standard of living of the farmers						0.94

Thus, total 30 statements with highest 't' values were selected for the construction of final scale as they differentiate between highest and lowest groups. The statements with low 't' value were deleted.

The list of finally selected statements for inclusion in the scale is furnished in the following table.

Table 2: List of total selected statements for final scale construction

S. No.	Statements	SA	A	UD	DA	SDA
A	**Impact of Agricultural Information**					
1.	Better seasonal crop management is possible due to the mobile based agro advisory services					
2.	Critical inputs can be optimally used by the farmer due to the guidance received through					
3.	MBAS helps farmer in proper insect pest and disease management					
4.	Dairy related information helps the farmer for raising the milch animals and setting up dairy enterprise					

5.	Farm mechanization is promoted due to MBAS					
6.	Farm operations like sowing, harvesting, marketing etc. can be performed well on time with the help of technical guidance					
7.	Farmer can shift the cropping pattern with the help of weather advisory services					
8.	Timely pest and disease forecasting leads to proper crop protection measures					
B	**Impact of Market information**					
1.	MBAS provides all the market prices of the different farm produce to the farmers					
2.	Advisories related to livestock market helps the farmer for getting higher profits in livestock trading					
3.	The farmer can select better market for their produce due to MBAS					
4.	MBAS provides better opportunity for purchasing quality inputs at fair prices					
5.	Farmers become aware about the malpractices at the market yard due to MBAS					
C	**Psychological Impact**					
1.	MBAS facilitates decision making of farmers about various agricultural operations					
2.	Farmers get motivated to visit the research system willingly for seeking detailed information on new technologies					
3.	MBAS improves farmers ability to negotiate with the trader about prices of their produce					
4.	MBAS strengthens conversation about farming practices among the farmers					
5.	MBAS makes farmers psychologically strong for facing new challenges					
D	**Social Impact**					
1.	MBAS improves the social relationship of the farmers					
2.	MBAS increases the involvement of farmers in social activities					
3.	The technical guidance through mobile phone improves the social and economic status of the farmer					
4.	Higher social involvement can be achieved by participating in the Agril. Exhibitions, Agril. Tour, field tour etc.					
5.	Social participation increases due to the knowledge gained through MBAS					
6.	Practical application of mobile based agro advisory affects social behaviour of the farmers					
E	**Economic Impact**					
1.	MBAS help farmers in effective planning of plant protection measures					
2.	MBAS reduces frequency of sprays in crops					
3.	Farmer can fetch better prices for their produce due to MBAS					
4.	Weather advisory delivered through MBAS can avert crop losses					
5.	Proper input management reduces economic losses of the farmers					
6.	Proper irrigation management reduces economic issues of farmers					

Reliability
Test-retest method
The final set of the 30 statements, which represent the impact of mobile based agro advisory services by state department of agriculture in Marathwada region, was administered on five-point continuum to a fresh group of 30 farmers, which were not included in the actual sample. After a period of 15 days the scale was again administered to the same respondents and thus two sets of scores were obtained. The correlation coefficient for the both the sets were worked out. The 'r' value (0.844) was significant at 0.01 level of probability indicating the attitude scale was highly suitable for administration to the farmers as the scale was stable and dependable in its measurement.

Validity
Content validity
The content validity of the scale was tested. The content validity is the representative or sampling adequacy of the content, the substance, the matter and the topics of a measuring instrument. This method was used in the present scale to determine the content validity of the scale. As the content of the impact was thoroughly covered the entire universe of mobile based agro advisory services of State Department of Agriculture through literature and expert opinion, it was assumed that present scale satisfied the content validity. As the scale value difference for almost all the statements included had a very high discriminating value, it seemed reasonable to accept the scale as a valid measure of the attitude. Thus, ensuring a fair degree of content validity for the scale.

References
1. Edwards AL. Techniques of Attitude Scale Construction. Appeton Century Crafts, New York, 1957, 149-160.
2. Kerlingetr FN. Scientific behavioural research. A Conceptual primer, New York, Holt, Rinchart and Winston, 1973.
3. Thrustones LL, Chave EG. The Measurement of opinion. American Journal of Sociology. 1928; 33:529-554.
4. Likert R. A technique for the measurement of attitudes, Archology Psychology, 1932, 140.
5. Lodhal TM, Kejner M. J Appl. Psy. 1965; 49:24-33.
6. Modem R, Seema B. A Scale to Measure Attitude of Extension professionals towards technology dissemination system of State Department of Agriculture (SDA) Indian Res. J Ext. Edu. 2017; 17(1):109-112.
7. Wang AK. Suggested criteria for writing attitude statement. J Soc. Psychol. 1932; 3:367-373.
8. Saravanan R, Suchiradipta B. mExtension - Mobile Phones for Agricultural Advisory Services. Note 17. GFRAS Good Practice Notes for Extension and Advisory Services. GFRAS: Lindau, Switzerland, 2015.