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Perception of Farmers towards Integrated Farming Systems in Select Agro-climatic Zones of Karnataka: A Methodological Approach.

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ABSTRACT

Farmers' perception about any developmental farming activity is an important input to policy makers/Government for designing policies for doubling income of farmers. To analyse the perception of farmers towards Integrated Farming System, a scale was developed based on Likert's technique of scale construction. A list of 65 statements, comprising both positive and negative statements indicating the perception of farmers was prepared according to suitability of study. The statements were refined based on the fourteen criteria suggested by Edwards(1957) to reduce ambiguity and the selected 53 statements were sent to 120 judges and experts in the field of Extension research, Education and Integrated Farming Systems for administration and rating. The statements selected were rated on a five point continuum ranging from Most Relevant to least Relevant. For the statements rated by the experts, the Relevancy Weight age (RW) and Mean Relevancy Score (MRS) were worked out individually, and based on this process, the original 53 statements were reduced to 31 statements as remaining were falling below set cut off values. Subsequently the modified scale with 31 statements was administered among forty selected farmers through random selection from the non-sampling areas. The total individual score of subjects was calculated by summing up the response score of each statement given by individual subjects. Based upon the total individual score arranged in descending order, the first 25 per cent of subjects with their total individual scores were considered as high group and last 25 per cent as the low group so that these two groups provided criterion groups in terms of evaluating the individual statements. The 't' values were worked out in order to discriminate the responses of high and low groups for the individual statements. Thus, out of 40 respondents to whom the statements were administered for the item analysis, ten respondents with highest and ten respondents with lowest scores were used as criterion groups to evaluate individual statement. Finally in this process 26 statements with significant discriminating t-values were retained in the final scale with the alpha coefficient value(Cronbach's Alpha) of 0.845, which is reliable for scale construction. The final developed scale can be used to measure farmers' perception in the present context and beyond the study area with suitable modifications.

Keywords: Continuum and agro climatic zones. Integrated farming system, perception, scale.

INTRODUCTION

Indian agriculture has the responsibility of providing food and nutritional security to its swarming millions at national as well as household level. More than 70.00 per cent of the total population of the country mainly depend on agriculture and allied enterprises for their livelihood. The mixed farming system of food crops with livestock (cow, buffalo, goat, sheep, poultry, pig, *etc.*) is the first choice of the farmers as an integral part of their farming system as it is being practiced by 86.00 per cent of farmers in India. (www.icar.org.in.2018). The factors such as Small land holdings of Indian farmers, Deteriorating Resource Base, Climate Change, High degree of risk and Uncertainty in Crop production, Narrowed Biodiversity, Technology Adoption Gaps, Low Rate of Farm Resource Recycling, Low income generation has severe impact on food, income and employment security of millions of poor farm households. (Shivaji, 2014). Farmer suicide in every district of Karantaka was observed during 2015-16, wherein highest number of suicides in the districts of Mandya, Haveri, Mysuru, Tumkur, Dharwad and Hassan districts were noticed owing to total crop loss (KSDA report, 2015-16). Present focus of Government initiatives

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of "Doubling Farmers Income by 2022" for which options and strategies as efforts by research and interventions development by all stakeholders is being envisaged for achieving this enviable target. One of the better options is to evaluate the potential of existing integrated farming system (IFS) in enhancing income of farm families within the reasonable time period. (Ponnusamy, 2017) & Buragohain *et. al.,* (2019).

Integrated farming system which is a judicious mix of two or more agri-enterprise system for minimum resource competition and maximum complementarity so as to support eco-friendly production, enhance employment, income and to enrich nutrition of farm families. Therefore, farmer's income would be increased and supplemented by allied enterprises like dairy, horticulture (vegetables/ fruits/ flowers/ medicinal and aromatic plants), apiary, mushroom cultivation, fisheries, sericulture, apiculture, silviculture *etc.* The basic aim of IFS is substantial and sustained increase in agricultural production which ensures livelihood and nutritional security (Kowsalya, 2017). In view of enormous benefits accrued due to adoption of feasible farm enterprise combinations, provision of broad-based extension strategy (involving various farm-related governmental departments) can further promote dairy based integrated farming systems to double the income of farmers. Thus there is a need for the study which will focus on the farmer's perception about need-based and system-oriented approaches on Integrated Farming System in order to reduce the present farm crisis. There were less number of standardized scales available for measuring the same. Hence, the present study was conducted to develop a Scale for measuring farmers' perception towards Integrated Farming Systems in select Agro-climatic zones of Karnataka, India.

METHODOLOGY

Comprehension of human perception is crucial for studying human behaviour. The Perception, in psychology, is the mental organization and interpretation of sensory information. It is the difference in the opinion of people in understanding the things happening around ones environment. Perception is operationalized in the present study as practical understanding of the farmers regarding utility and interpretation of various aspects of Integrated Farming System (IFS) practices through their experiences.

Scaling is a procedure of measuring an attribute of a person/ event/ others, by creating objects (statements representing the specific attribute) and assigning the objects to numbers according to rules. Scaling process, involves creating a continuum upon which measured objects are locatedbased on rules.

The method of summated rating suggested by Likert (1932) and Edwards (1957) was followed in the development of the scale. Likert scale is subject-centred/ individual difference scale which measures individual differences among respondents with respect to their possession or standing on a particular attribute or aspect. Likert scales are the most commonly used one in survey research for developing scales. Likert scales with five- or seven-point scales can generate adequate variance for examining the relationships among items and scales, and create adequate internal consistency reliability (Lissitz and Green, 1975).

The following steps were considered for constructing the perception scale.

Collection of statements: An exhaustive list of facts and figures about the different dimensions related to the perception of farmers towards Integrated Farming Systems in select Agro-climatic zones of Karnataka were collected and framed into statements. Care was taken to include both positive and negative statements in the list. An exhaustive list of 65 statements was prepared from available published literature and reports, and also by discussion and consultation with experts, researchers and other relevant professionals in the field of Extension Education, Integrated Farming Systems and Progressive Farmers.

Editing of statements: The statements were refined based on the 14 criteria suggested by Edwards (1957) for construction of scale statements and accordingly 12 statements were eliminated after screening and 53 statements were retained after editing and selected for judge's rating.

Response to raw statements: The Statements, selected in previous step, were sent to a group of 120 experts through personal contact, email and an online survey form was designed using the Google forms, to elicit response of judges who are distantly located. The judges were requested to check each and every statement for its relevancy on a 5 point continuum *i.e.* Most Relevant, Relevant, Somewhat relevant, Less relevant and Not relevant, with scoring 5, 4, 3, 2 and 1 respectively to measure perception of farmers towards Integrated Farming Systems. Also the judges were requested to make necessary modifications and additions or deletions, if they desired so. Response from 55 judges were received in the duly filled questionnaire in a specified time period of two months.

RESULTS AND DISCUSSION

Relevancy test of the selected statements

The Relevancy Weightage (RW) and Mean Relevancy Score (MRS) were worked out for all the selected statements individually by following methodology adopted by Kumar and Popat 2009,Maiti *et al.* 2016, and Gopika M.H. 2018. (Annexure I).

ANNEXURE 1: Relevancy weightage (RW) and Mean Relevancy Score (MRS) of each statement to measure Perception of farmers towards Integrated farming systems.

Statements	RW	MRS
Integrated farming system (IFS) ensures livelihood security of farm family.	0.95	4.76
IFS helps to increase income diversification	0.88	4.42
IFS provides employment to the farm family round the year	0.92	4.60
Through integration of different enterprises, IFS helps to achieve optimum production level	1.02	5.11
Interdependence of different farming systems ensures effective utilization of farm resources.	0.89	4.47
There is no doubt that IFS can enhance overall farm productivity	0.84	4.18
Cost of production could be minimised by following IFS.	0.80	4.02
IFS provides greater opportunity to produce diversified products from agriculture and allied enterprises.	0.97	4.87
By adopting IFS, agricultural land is effectively/fully utilised.	0.89	4.44
IFS provides good recognition to farmers.	0.70	3.49
IFS helps in improving the knowledge and skills of the farmers.	0.78	3.91
The standard of living of farmers is enhanced by adopting IFS.	0.76	3.82
IFS helps in reducing fodder scarcity.	0.78	3.89
IFS reduces vulnerability of farmers in adverse climatic conditions.	0.89	4.44
IFS farmers are more aware about farm management and profit maximization.	0.78	3.91
Managing many enterprises is labour intensive	0.75	3.75
IFS motivates the farmers to adopt new technologies.	0.75	3.75
IFS ensures good linkage with neighbour farmers.	0.68	3.38
Adoption of IFS results in higher benefit-cost ratio with greater outcome.	0.83	4.13
IFS units act as model farms in the local area.	0.83	4.13
IFS ensures the complimentary combination of different farm enterprises	0.87	4.36
IFS helps in maintaining sustainable soil fertility and soil health.	0.87	4.33
IFS requires high initial investment.	0.72	3.62
Resource utilisation is more efficient in IFS over conventional method	0.90	4.51
Appropriate selection of enterprises results in more profit generation.	0.81	4.07
Dairy farming is a significant and most promising choice among different components of Integrated farming systems.	0.82	4.11
The IFS is complex, to adopt and practice	0.68	3.40
Maintaining three or more enterprises in a farm increases incidence of pests and diseases	0.55	2.76
It is easy to adopt IFS successfully, with the help of various stakeholders.	0.67	3.33
The merits and demerits related to each enterprise of IFS should be identified in terms of cost, returns, and effects on soil fertility.	0.76	3.78
IFS provides adequate protection against risk and uncertainties of the farm yield.	0.85	4.24
IFS practices are not compatible with the values and beliefs of farming community.	0.53	2.67
IFS helps in reduction of fertilizer requirement.	0.76	3.80
Integrating enterprises in IFS requires technical skill and more resources	0.76	3.82
S help in efficient recycling of the farm bio-mass and animal waste.	0.87	4.36
IFS helps in building symbiotic relation between different enterprises.	0.83	4.16
There is no need to combine different farm enterprises to stabilize ones farm income	0.53	2.65
Involving different enterprises has no influence on farm productivity	0.49	2.44
New Government schemes, subsidies and provision for the new start-ups/enterprises are useful in adopting IFS.	0.69	3.47
IFS require more time to generate profit over conventional farming.	0.61	3.07
It is difficult to choose more than one enterprise for IFS.	0.54	2.71
Lack of remunerative prices for farm produce and high price fluctuation creates difficult situation for farmers.	0.70	3.51
Timber and fire wood required for domestic purpose will be met through IFS system without affecting the natural forestry	0.70	3.51
Supply of biogas will mitigate the fuel crisis	0.69	3.45
IFS requires more skilled labour which leads to increase in labour cost	0.64	3.18
IFS leads to reduce soil erosion and improve water infiltration	0.83	4.16
Problem in transportation and exploitation by the middleman hampers marketing of IFS products	0.65	3.27
IFS improves cosmopoliteness among farmers	0.71	3.56
The farmers find it difficult to sell their produce profitably due to lack of good market and marketing facilities.	0.75	3.75
Higher income generation is assured through marketing of various products at various seasons	0.82	4.09
IFS help in efficient recycling of the farm bio-mass and animal waste.	0.84	4.18
IFS helps in supply of balanced and nutritious food to the family due to combination of various enterprises	0.87	4.36
It is not possible for farmers to maintain all types of machineries required for different crops	0.71	3.56

Relevancy Weightage (RW)

$$= \frac{\text{Most relevant response}*5+\text{Relevant response}*4+\text{Somewhat relevant}*3+\text{Less relevant response}*2+\text{Not relevant}*1}{\text{Maximum possible score}}$$

Mean Relevancy Score (MRS) =

$$\frac{\text{Most relevant response}*5+\text{Relevant response}*4+\text{Somewhat relevant}*3+\text{Less relevant response}*2+\text{Not relevant}*1}{\text{Number of judges}}$$

The minimum cut off was set based on the required minimum criteria at 0.75 for the relevancy weight age and 3.75 in case of mean relevancy score. As a result the final selected statements were 31 in number, after the systematic screening.

Item Analysis

Item analysis is an important step while constructing valid and reliable scale. The final selected statements from the relevancy test were restructured and modified following the suggestion of experts of relevant domain. The modified measurement instrument of perception was

administered among forty farmers of non-sampling area (Ragihalli village, Anekal taluk, Bengaluru District), selected through random sampling, who were following Integrated farming systems. Respondents were requested to give their response on a five point continuum in a personal interview by the researcher. The total individual score of subjects was calculated by summing up the response score of each statement given by individual subjects.

Calculation of 't' values

For calculation of 't' value, the subjects were arranged in descending order based on the total individual score. The first 25 per cent of subjects with their total individual scores were considered as 'high group' and last 25 per cent as the 'low group' and these two groups indicated the criterion groups in terms of evaluating the individual statements.

The't' values were worked out in order to discriminate the responses of 'high and low' groups for the individual statements by using theformula given by Edwards(1957) as presented below. Thus, out of 40 subjects to whom the statements were administered for the item analysis, 10 subjects with highest and 10 subjects with lowest scores were used as criterion groups to evaluate individual statement.

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

Where,

$$\sum(X_H - \bar{X}_H)^2 = \sum X_H^2 - \frac{(\sum X_H)^2}{n}$$

$$\sum(X_L - \bar{X}_L)^2 = \sum X_L^2 - \frac{(\sum X_L)^2}{n}$$

$\bar{X}_H$ = The mean score on a given statement for the high group

$\bar{X}_L$ = The mean score on a given statement for the low group

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

$\sum X_L^2$ Sum of squares of the individual score on a given statement for low group

$\sum X_H$ = Summation of scores on given statement for high group

$\sum X_L$ = Summation of scores on given statement for low group

n = Number of subjects in low and high group

t = The extent to which a given statement differentiate between the high and low groups

$\sum$ = Summation

The 't' value is a measure of the extent to which a given statement differentiates between the high score and low score groups. As a crude and approximate rule of thumb, we may regard any 't' value equal to or greater than 1.75 as indicating that the average response of high and low groups to a statement differs significantly. Thus a total of 26 statements (23 Positive and 3 negative) for measuring the perception of farmers towards Integrated Farming Systems with significant discriminating values were retained in the final scale.

Sample Statement 1: 'Integrated Farming System (IFS) helps to increase income diversification'. The calculation of 't' value is for measuring the extent to which a given statement differentiates between the high and low score groups.

Statement 1	Response	Low group				High group			
Integrated farming system (IFS) helps to increase income diversification	Category	x	F	Fx	fx2	x	f	fx	fx2
	MR	5	0	0	0	5	9	45	225
	R	4	2	8	32	4	1	4	16
	SWR	3	5	15	45	3	0	0	0
	LR	2	3	6	18	2	0	0	0
	NR	1	0	0	0	1	0	0	0
		Sum	10	29	95		10	49	241
			nL	XL	XL2		nH	XH	XH2

Where, x = Score assigned to the response category; f = Frequency

$$\bar{X}_H = \frac{\sum X_H}{nL} = \frac{49}{10} = 4.9 \quad \text{and} \quad \bar{X}_L = \frac{\sum X_L}{nL} = \frac{29}{10} = 2.9$$

$$\sum(X_H - \bar{X}_H)^2 = \sum X_H^2 - \frac{(\sum X_H)^2}{n} = 241 - (2401)/10 = 0.9$$

$$\sum(X_L - \bar{X}_L)^2 = \sum X_L^2 - \frac{(\sum X_L)^2}{n} = 95 - (841)/10 = 10.9$$

$$t = \frac{\bar{X}_H - \bar{X}_L}{\sqrt{\frac{\sum(X_H - \bar{X}_H)^2 + \sum(X_L - \bar{X}_L)^2}{n(n-1)}}} = 4.9 - 2.9 / \sqrt{\frac{0.9+10.9}{10(10-1)}} = 2.0 / \sqrt{\frac{11.8}{90}} = 5.523;$$

t value = 5.523

Table 1: A list of selected statements for final scale construction with their respective 't' values.

Statements	t- Values
Integrated Farming System (IFS) helps to increase income diversification.	5.523
Integrated Farming System (IFS) ensures livelihood security of farm family.	4.346
Interdependence on different farming systems ensures effective utilization of farm resources.	4.198
IFS provides employment to the farm family round the year	3.851
Lack of remunerative prices for farm produce and inadequate marketing facilities, creates difficult situation for farmers.	3.630
Dairy farming is a significant and most promising choice among different components of Integrated farming systems.	3.401
IFS provides adequate protection against risk and uncertainties of the farm yield.	3.280
IFS helps in maintaining sustainable soil fertility and soil health.	3.151
Through integration of different enterprises, IFS helps to achieve optimum production level	3.149
IFS helps in supply of balanced and nutritious food to the family due to combination of various enterprises	3.013
IFS provides greater opportunity to produce diversified products from agriculture and allied enterprises.	3.011
IFS ensures the complimentary combination of different farm enterprises	2.941
The standard of living of farmers is enhanced by adopting IFS	2.868
IFS units act as model farms in the local area.	2.874
IFS help in efficient recycling of the farm bio-mass and animal waste.	2.811

Cost of production could be minimised by following IFS.	2.774
IFS helps in improving the knowledge and skills of the farmers	2.746
IFS helps in building symbiotic relation between different enterprises.	2.682
Appropriate selection of enterprises results in more profit generation.	2.646
IFS requires more skilled labour which leads to increase in labour cost	2.597
IFS motivates the farmers to adopt new technologies.	2.523
It is easy to adopt IFS successfully, with the help of various stakeholders.	2.479
IFS improves cosmopoliteness among farmers	2.465
IFS helps in reducing fodder scarcity.	2.415
Integrating enterprises in IFS requires technical skills and more resources.	2.325
IFS farmers are more aware about farm management and profit maximization.	2.301

*negative Statements

Standardisation of the scale: The validity and reliability was ascertained for standardisation of the scale.

Reliability of the scale

Reliability refers to the precision or accuracy of the measurement instrument. It is the degree of consistency between multiple measurements of a variable. Used when you have multiple questions in a survey/questionnaire that form a scale and you wish to determine if the scale is reliable or not. Cronbach alpha (Internal consistency reliability) coefficient was used to determine the reliability of the measuring instrument. Cronbach alpha coefficient was calculated on SPSS 20.0 *viz.,* Analyse> Scale > Reliability Analysis >Check Items: Item, Scale, Scale if Deleted, Correlations > Click Continue and Ok > Reliability Statistics> Cronbach Alpha value. The alpha coefficient value of research scale was found to be 0.845which is significant and positive indicating that the whole scale was reliable. The ideal value for Cronbach alphain research is minimum 0.70 (Nunnally and Bernstein, 1994), hence the whole scale was found to be reliable.

Validity of the scale

Validity is the extent to which a scale accurately represents the concept or construct of interest. In simple, a scale is valid, if and only if it measures what it is supposed to measure. 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. The content of the final scale was finalized through exhaustive literature survey, followed by interaction with experts of the relevant field, farmers and other researchers. In addition the judgement survey conducted prior to its finalization and selection of indicators according to the relevancy weightages ensured the content validity of the instrument. The statements had at least 80 per cent judges' agreement were retained. This indicated validity of the scale content. As the scale value difference for almost all the statements included had discriminating values, it seemed reasonable to accept the scale as valid measure of the desired dimension.

Administration of the scale

The final scale consisting of 26 statements was administered to the IFS farmers on a 5 point continuum viz., Most Relevant, Relevant, Somewhat relevant, Less relevant and Not relevant, with scoring 5, 4, 3, 2 and 1 respectively for positive statements and reverse scoring system for negative statements. Scores were summed up to get the total score for perception of each respondent. The overall possible maximum and minimum score ranges between 130 to 26. The high score will indicate that respondent will have high level of perception about Integrated Farming Systems

Table 2: Standardized scale to measure the farmer's perception towards Integrated Farming Systems

Statements	MR	R	SWR	LR	NR
Integrated farming system (IFS) helps to increase income diversification.					
Integrated farming system (IFS) ensures livelihood security of farm family.					
Interdependence of different farming systems ensures effective utilization of farm resources.					
IFS provides employment to the farm family round the year					
Lack of remunerative prices for farm produce and inadequate marketing facilities, creates difficult situation for farmers.					
Dairy farming is a significant and most promising choice among different components of Integrated farming systems.					
IFS provides adequate protection against risk and uncertainties of the farm yield.					
IFS helps in maintaining sustainable soil fertility and soil health.					
Through integration of different enterprises, IFS helps to achieve optimum production level					
IFS helps in supply of balanced and nutritious food to the family due to combination of various enterprises					
IFS provides greater opportunity to produce diversified products from agriculture and allied enterprises.					
IFS ensures the complimentary combination of different farm enterprises					
The standard of living of farmers is enhanced by adopting IFS					
IFS units act as model farms in the local area.					
IFS help in efficient recycling of the farm bio-mass and animal waste.					
Cost of production could be minimised by following IFS.					
IFS helps in improving the knowledge and skills of the farmers					
IFS helps in building symbiotic relation between different enterprises.					
Appropriate selection of enterprises results in more profit generation.					
IFS requires more skilled labour which leads to increase in labour cost					
IFS motivates the farmers to adopt new technologies.					
It is easy to adopt IFS successfully, with the help of various stakeholders.					
IFS improves cosmopoliteness among farmers					
IFS helps in reducing fodder scarcity.					
Integrating enterprises in IFS requires technical skills and more resources.					
IFS farmers are more aware about farm management and profit maximization.					

*Negative Statements, MR = Most Relevant, R = Relevant, SWR = Somewhat relevant, LR = Less relevant and NR = Not relevant

CONCLUSION

The reliability and validity of the scale indicate the precision and consistency of the results. Farmer's perception about any farming activity for development is precious source to policy makers/Government for designing policies for doubling income of farmers. This scale can be used to measure the farmers' perception towards Integrated Farming Systems beyond the study area with suitable modifications and evaluation of reliability and validity.

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