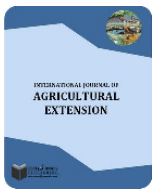

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FARMER'S PERCEPTION TOWARDS INTEGRATED FARMING SYSTEMS IN MAHARASHTRA: A METHODOLOGICAL APPROACH

[a]Argade S. Dadabhau, [b]Gopal Sankhala, [c]Wadkar S. Kisan
[a] *ICAR-Central Institute for Women in Agriculture, Bhubaneswar, Odisha, India.*
[b] *ICAR-National Dairy Research Institute, Karnal, Haryana, India.*
[c] *Tata Institute of Social Sciences, Mumbai, India.*

A B S T R A C T

Farmer's perception about any developmental activity is priceless resource to policy makers for designing policies in order to reduce vulnerabilities of farmers. A scale was developed to measure the farmer's perception towards Integrated Farming Systems based on Likert's technique of scale construction. A list of 50 positive and negative (60:40) statements indicating the perception of farmers was prepared according to suitability of study. The statements were edited in the light of fourteen informal criteria suggested by Edwards. The remaining 37 statements out of 50 were sent to the 60 judges who were the experts in the field of Integrated Farming Systems for rating on three point continuums. The total individual score of judges was calculated by summing up the weights given by judges to the individual statement. On the basis of total individual scores of judges, the top 25 per cent of judges with the highest total scores and the bottom 25 per cent of judges with lowest total scores were taken as assuming that these two groups provide criterion groups in terms of which to evaluate the individual statements. On the basis of calculated 't' values for all statements, 15 statements (11 positive and 4 negative) were retained in the final scale. This scale can be used to measure farmer's perception beyond the study area with suitable modifications.

Keywords: Farmer, farming systems, perception, scale.

INTRODUCTION

The Indian economy is predominantly rural and agricultural. Indian agriculture has responsibility of providing food security to its spilling over millions. This is a very complex and serious problem, when share of agriculture in gross domestic product is declining and average size of landholding is contracting. The average size of the landholding has declined to 1.16 ha during 2010-11 from 2.28 ha in 1970-71(Agriculture Census, 2010). The declining trend in size of land holding poses a serious challenge to the sustainability and profitability of farming. Ill effects of green revolution are threatening the sustainability of the important agricultural production systems especially in Punjab and Haryana. It is imperative to develop strategies that enable adequate employment and income generation, especially for small and marginal farmers who constitute more than 80% of the farming community. Under the gradual shrinking of land holding, horizontal expansion of land based enterprises is not possible. Hence, vertical integration land based enterprises within the socio-economic environment of the farmers will make farming more profitable and dependable. Hence, integrated farming systems are viewed as a sustainable alternative to commercial farming systems particularly on marginal lands with the objective of reversing resource degradation and stabilizing farm incomes. The integrated farming system approach is considered to be the most powerful tool for enhancing profitability of farming systems. Integration of enterprises lead to greater dividends than single enterprise based farming, especially for small and marginal farmers. It also leads to improvement in nutritional quality of daily diet of farmers. Understanding of farmers' perception towards Integrated Farming Systems can contribute to scientific and policy discussions on Integrated Farming System approach. Nishara (2003) reported that households

* Corresponding Author:
Email: argadeshivaji@yahoo.com

were vulnerable due to lack of income diversification, income security and savings. According to Fraser et al. (2005), the greater diversity is believed to increase the ability of systems to withstand shocks and thereby decrease vulnerability. Biswarup (2006) concluded that 24.37 per cent of the respondents were having good potentiality to realize opportunity to diversify their livelihood for securing wellbeing as well as reducing the vulnerability. Households with better education, owning productive assets like land or cattle, having nonfarm employment opportunities, income diversification and access to resources, higher social participation and markets were less vulnerable. Felipe (2007) observed that organic farmers had minor risk sensation than conventional farmers. Venkatadri et al. (2008) revealed that about 98 per cent of farmers opined that livestock rearing reduces vulnerability in drought years, dairy farming provides sustainable livelihoods (97.8%), farmers suicides are less in dairy developed areas (97%) and commercial agriculture increased suicidal rate in Andhra Pradesh (96.0%). Under the above discussed circumstances, it arises a need for a study which will focus on the farmer's perception about innovative approaches like Integrated Farming System in order to reduce farm vulnerabilities. But there was no standardized scale available for measuring the same. Hence, the present study was conducted to develop a scale for measuring farmer's perception towards Integrated Farming Systems in backward districts of Maharashtra, India.

MATERIALS AND METHODS

Perception is mental organization and interpretation of sensory information. It is the opinion expressed by the respondents. Perception was operationally defined as the meaningful sensation about Integrated Farming Systems (IFS) as perceived by the farmers. Understanding the process of human perception is crucial to understanding human behaviour. The method of summated rating suggested by Likert (1932) and Edwards (1957) was followed in the construction of scale. The following steps were considered for constructing the perception scale.

a) Collection of statements: The first step in the construction of perception scale is to collect statements related to the perception towards reduction in farm vulnerability through Integrated Farming Systems. A care was taken to include positive and negative (60:40) statements in the list. A tentative list of 50 statements was prepared from available literature, consultation with experts in the field of Extension Education, Integrated Farming Systems and Progressive Farmers.

b) Editing of statements: The statements were edited as per 14 informal criteria suggested by Edwards (1957)as outcome 13 statements were eliminated. Finally, 37 statements were retained after editing and considered for judge's response.

c) Response to raw statements: The performa containing 37 raw statements on three point continuums i.e. Agree, Uncertain and Disagree was sent by post, through e-mail and also handed over personally to the total of 60 judges. These judges were experts in the field of Extension Education, Integrated Farming Systems and Progressive Farmers. The judges were requested to indicate their response by ticking in suitable continuum in front of each statement. Also the judges were requested to make necessary modifications and additions or deletions, if they desired so. Out of 60 judges 50 judges had returned the same set of statements after duly recording their judgements in a stipulated span of 2 months. Out of 50 judges response, 6 responses were found incomplete and unsuitable for item analysis. Hence, they were eliminated. The remaining 44 responses were considered for the item analysis.

d) Item analysis: Item analysis is an important step while constructing valid and reliable scale. The judges were asked to indicate their degree of agreement or disagreement on each statement with three point continuums 'Agree', 'Uncertain' and 'Disagree' with scoring 3, 2, and 1, respectively for positive statements and vice-versa for negative statements. The total individual score of judges was calculated by summing up the response score of each statement given by individual judge.

e) Calculation of 't' values: Based upon the total individual scores, the judges were arranged in descending order. The top 25 per cent of judges with their total individual scores were considered as high group and the bottom 25 per cent as the low group so that these two groups provided criterion groups in terms of which to evaluate the individual statements. Thus, out of 44 judges to whom the statements were administered for the item analysis, 11 judges with highest and 11 judges with lowest scores were used as criterion groups in terms of which to evaluate the individual statements.

Table 1. A list of 37 statements with their respective 't' values.

Sr.	Statements	't' Value
1	IFS helps to increase income diversification.	2.56
2	IFS ensures food and nutritional security of farm family.	2.81
3	IFS brings farm diversity which leads to decrease farm vulnerability.	0.43
4	IFS farmers have less risk sensation than conventional farmers.	0.36
5	IFS reduces vulnerability of farmers in adverse conditions.	4.05
6	Farmer's suicides are less in IFS practicing areas.	0.72
7	Crop integration helps to mitigate weeds, pest and disease problems.	3.68
8	IFS leads to reduce soil erosion and improve water infiltration.	1.29
9	The manure and organic waste obtained from IFS farms reduce fertilizer requirement.	2.39
10	IFS helps to achieve optimum production level through integration.	1.93
11	IFS provides great opportunity to produce diversified products.	2.25
12	Integrated management practices reduce input needs of farmers to some extent.	0.90
13	Risk of crop failure is less in IFS compared to conventional farming.	0.78
14	IFS helps poor farmers to reduce their vulnerability to climate-related hazards.	0.93
15	IFS helps to protect environment through recycling of animal waste.	2.12
16	Energy crisis can be postponed through effective recycling of the organic waste in IFS.	0.29
17	Fodder shortage can be managed by planting perennial fodder trees as a part of IFS.	1.78
18	IFS farmers would get reputation among their fellow farmers due to adoption of IFS.	1.36
19	Every piece of land is effectively utilized in IFS.	1.77
20	IFS motivates the farmers to adopt new technologies.	0.79
21	IFS provides enough scope to employ family members round the year.	2.5
22	IFS reduces vulnerability to economic loss through diversification.	1.32
23	IFS upholds the farmers socio-economically as well as socio-psychologically.	0.90
24*	IFS is unable to solve all the problems of small and marginal farmers.	1.09
25*	In IFS, soil fertility and crop productivity are difficult to manage.	0.55
26*	IFS increases risks of short-term indebtedness.	1.39
27*	Marketing of different products from IFS farm is very difficult.	3.03
28*	IFS requires more skilled labour which leads to increase in labour cost.	0.56
29*	IFS involves some level of stress for both farmers and their family members.	0
30*	The management of IFS farm is more difficult than conventional farm.	1.77
31*	IFS requires high initial investment.	0.29
32*	The long transition period in IFS poses threats to the food and income security of farmers.	1
33*	IFS is unable to meet location-specific needs of the farmers.	1.31
34*	It is not possible for farmers to maintain all types of machineries required for different crops.	0.55
35*	IFS values are not compatible with the values and beliefs of farming community.	1.90
36*	IFS increases competition for resources among different enterprises.	1.80
37*	It is difficult for farmers to acquire knowledge and skill about different enterprises.	1.29

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 statement was calculated by using the formula given by Edwards (1957).

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

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

$\bar{X}_H$ = 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;

∑XH2= Sum of squares of the individual score on a given statement for high group;
∑XL2=Sum of squares of the individual score on a given statement for low group;
∑XH=Summation of scores on given statement for high group;
∑XL= Summation of scores on given statement for low group;
n = Number of judges in low and high groups
t= The extent to which a given statement differentiate between the high and low groups.
∑ = Summation

Sample Statement: IFS reduces vulnerability of farmers in adverse conditions. The calculation of 't' value for measuring the extent to which a given statement differentiates between the high and low groups of the respondents.

Statement	Response category	Low group				High group			
		X	f	fX	fX2	X	f	fX	fX2
IFS reduces vulnerability of farmers in adverse conditions	Agree	3	0	0	0	3	7	21	63
	Uncertain	2	10	20	40	2	4	8	16
	Disagree	1	1	1	1	1	0	0	0
		∑	11	21	41	∑	11	29	79
			nL	∑XL	∑XL2		nH	∑XH	∑XH2

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

$$\bar{X}_L = \frac{\sum X_L}{n_L} = \frac{21}{11} = 1.91 \qquad \bar{X}_H = \frac{\sum X_H}{n_H} = \frac{29}{11} = 2.64$$

$$\sum (X_L - \bar{X}_L)^2 = \sum {X_L}^2 - \frac{(\sum X_L)^2}{n} = 41 - \frac{(21)^2}{11} = 0.91$$

$$\sum (X_H - \bar{X}_H)^2 = \sum {X_H}^2 - \frac{(\sum X_H)^2}{n} = 79 - \frac{(29)^2}{11} = 2.55$$

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

$$= \frac{2.64 - 1.91}{\sqrt{\frac{2.55 + 0.91}{11(11-1)}}} = \frac{0.73}{0.18} = 4.05$$

The 't' value is a measure of the extent to which a given statement differentiates between the high and low 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, 15 (11 positive and 4 negative) statements for measuring the farmers' perception towards Integrated Farming Systems with significant 't' values were retained in the final scale (Table 2).

Table 2. A list of selected statements for final scale construction with their respective 't' values.

Sr.	Statements	't' Value
1	IFS reduces vulnerability of farmers in adverse conditions.	4.05
2	Crop integration helps to mitigate weeds, pest and disease problems.	3.68
3*	Marketing of different products from IFS farm is very difficult.	3.03
4	IFS ensures food and nutritional security of farm family.	2.81
5	IFS helps to increase income diversification.	2.56
6	IFS provides enough scope to employ family members round the year.	2.5
7	The manure and organic waste obtained from IFS farms reduce fertilizer requirement.	2.39
8	IFS provides great opportunity to produce diversified products.	2.25
9	IFS helps to protect environment through recycling of animal waste.	2.12
10	IFS helps to achieve optimum production level through integration.	1.93
11*	IFS values are not compatible with the values and beliefs of farming community.	1.90
12*	IFS increases competition for resources among different enterprises.	1.80
13	Fodder shortage can be managed by planting perennial fodder trees as a part of IFS.	1.78
14	Every piece of land is effectively utilized in IFS.	1.77
15*	The management of IFS farm is more difficult than conventional farm.	1.77

* Negative Statement

f) Standardisation of the scale: The validity and reliability was ascertained for standardisation of the scale. The reliability and validity was measured by split half method and content validity, respectively.

i) Reliability of the scale: A scale is reliable when it gives consistently the same results when applied to the same sample. The final set of the 15 statements which represent the farmers' perception towards Integrated Farming Systems, was administered on three point continuums to a fresh group of 24 IFS farmers (10% of actual sample size for the study) from non-sample area and which was not included in the actual sample size of study. The designed perception scale for the study was pre-tested for its reliability by using the split half method in which a scale is divided into two halves. One half (one set) contains the odd numbered statements (1, 3,.....,15) and the other half (other set) contains the even numbered statements(2, 4,.....,14). The total individual score of each farmer was calculated by summing up the responses given by farmers on two halves of the statements. The correlation coefficient (rhh) between scores of two halves of statements was 0.76. The positive and significant correlation between the two sets of scores indicated that the scale was reliable. The reliability coefficient of whole scale was calculated by the formula given by Spearman (1910) and Brown (1910) as follows;

$$r_{SB} = \frac{2 * r_{hh}}{1 + r_{hh}}$$

Where, r_{SB} = Reliability coefficient of the whole scale
rhh = Reliability coefficient of the half-scale, found experimentally i. e. 0.76

$$r_{SB} = \frac{2 * r_{hh}}{1 + r_{hh}} = \frac{2 * 0.76}{1 + 0.76} = \frac{1.52}{1.76} = 0.86$$

The reliability coefficient of whole scale was 0.86 which found significant and positive indicated that the whole scale was reliable.

ii)Validity of the scale: It is the property that ensures the obtained test score as valid, if and only if it measure what it is supposed to measure. A scale is said to be valid if it stands for one's reasoning. The content validity of the scale was tested by experts' judgement. 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 perception scale was thoroughly covered through literature scan and expert opinions. The statements had at least 80% 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.

Table 3. Standardized scale to measure the farmer's perception towards Integrated Farming Systems.

Sr.	Statements	A	UC	DA
1	IFS reduces vulnerability of farmers in adverse conditions.			
2	Crop integration helps to mitigate weeds, pest and disease problems.			
3*	Marketing of different products from IFS farm is very difficult.			
4	IFS ensures food and nutritional security of farm family.			
5	IFS helps to increase income diversification.			
6	IFS provides enough scope to employ family members round the year.			
7	The manure and organic waste obtained from IFS farms reduce fertilizer requirement.			
8	IFS provides great opportunity to produce diversified products.			
9	IFS helps to protect environment through recycling of animal waste.			
10	IFS helps to achieve optimum production level through integration.			
11*	IFS values are not compatible with the values and beliefs of farming community.			
12*	IFS increases competition for resources among different enterprises.			
13	Fodder shortage can be managed by planting perennial fodder trees as a part of IFS.			
14	Every piece of land is effectively utilized in IFS.			
15*	The management of IFS farm is more difficult than conventional farm.			

*Negative Statement, A- Agree, UC- Uncertain, DA- Disagree

g) Administration of the scale: The final scale consisting of 15 (Table 3) statements can be administered to the Integrated Farming System (IFS) farmers on a three continuums viz., Agree (A), Uncertain (UC) and Disagree (DA) with a score of 3, 2 and 1, respectively for positive statements and reverse scoring

system for negative statements. The overall possible maximum and minimum score ranges between 45 to 15. The high score will indicate that respondent will have high level of perception about Integrated Farming Systems.

CONCLUSION

The reliability and validity of the scale indicate the precision and consistency of the results. Farmer's perception about any developmental activity is priceless resource to policy makers for designing policies in order to reduce vulnerabilities of farmers. This scale can be used to measure the farmer's perception towards Integrated Farming Systems beyond the study area with suitable modifications and evaluation of reliability and validity.

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