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Determinants of farmers' perception towards integrated farming system in Navsari district of South Gujarat

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Abstract

Integrated Farming System (IFS) is a sustainable and economically viable approach for improving farm productivity, profitability, resource-use efficiency and income diversification, particularly among small and marginal farmers. Understanding farmers' perception is an important prerequisite for assessing their acceptance and adoption of IFS. The present study was conducted in Navsari district of South Gujarat during 2025–26 to analyse the relationship between farmers' profile characteristics and their perception towards IFS and to determine the extent of variation in perception explained by selected independent variables. An ex-post facto research design was followed and 120 farmers were selected through multistage random sampling from the selected villages of Navsari district. Primary data were collected through personal interviews using a structured interview schedule and analysed using frequency, percentage, mean, standard deviation, Karl Pearson's correlation coefficient and stepwise multiple regression analysis. The findings revealed that education, farming experience, land holding, annual income, livestock possession, risk orientation, mass media utilization, extension participation and economic motivation had a positive and significant relationship with farmers' perception towards IFS, whereas age and family size showed non-significant relationships. Stepwise regression analysis identified livestock possession, risk orientation, economic motivation, extension participation and farming experience as significant predictors of perception. The final regression model explained 42.4 per cent of the variation in farmers' perception ($R^2 = 0.424$), with an adjusted R^2 of 0.399. Livestock possession emerged as the most important predictor. The study suggests strengthening extension services through regular training, field demonstrations, farmer field schools and exposure visits, along with financial support, improved credit accessibility and market infrastructure to promote effective implementation of IFS in Navsari district.

Keywords: Integrated farming system, farmers' perception, livestock possession, risk orientation, extension participation, economic motivation, stepwise regression

Introduction

Indian agriculture sector provides livelihood support to about 42.30 per cent of the population and has a share of 18.20 per cent in the country's GDP at current prices (Anonymous, 2024) [2]. Sustainable development is the most appropriate approach to promoting the rational use of natural resources and environmental conservation without compromising economic progress and development across the world. In this context, the Integrated Farming System (IFS) has emerged as a sustainable and economically viable solution (Kumar *et al.*, 2022) [5].

The Integrated Farming System (IFS) is a holistic farming approach specially designed for small/marginal farmers to enhance the system productivity, profitability and employment generation of their farm (Bhagat *et al.*, 2024) [3]. In an integrated farming system, every business is interrelated or waste from one production system becomes input for

another production system. This can reduce costs and increase production and income (Nababan and Regina, 2021) [7].

The Integrated Farming System (IFS) approach is widely regarded as an effective strategy for enhancing agricultural productivity and profitability, particularly among small and marginal farmers (Tripathi *et al.*, 2025) [10]. Integrated farming systems improve land-use efficiency by promoting synergistic interactions among different crop and livestock enterprises. The recycling of farm resources within the system reduces dependence on external inputs, particularly chemical fertilizers, which can help lower production costs while minimizing environmental degradation and promoting sustainable agricultural production (Widadie *et al.*, 2025) [11]. An integrated farming system with available resources accessible to farmers ensures high standard of food production with minimum environmental impact even in

highly vulnerable climate (Nair *et al.*, 2019) ^[8]. Crop husbandry, horticulture, dairying, poultry, apiculture, sericulture, fish farming, forestry, goat rearing, sheep rearing, piggery, rabbitry, duck rearing, pigeon rearing, mushroom cultivation, azolla farming, kitchen gardening, fodder production, seed production, vermiculture, value addition are the major components of any integrated farming system models (Ramya, 2021) ^[9].

Perception is a process by which individuals organize and interpret their sensory impression in order to give meaning to their environment. It is important to understand perception since people's behaviour is based on their perception of what reality is, not on it reality itself. The world as it is perceived is the world that is behaviourally important. Understanding the process of human perception is crucial to understanding human behaviour (Meshram *et al.*, 2021) ^[6].

Gujarat is characterized by diverse agro-climatic conditions with eight agro-climatic zones, five are arid to semi-arid while remaining three are dry sub-humid in nature and having annual rainfall range of 250-1500 mm. The small and marginal farmers constituted about 66.40 per cent of total cultivators who are holding about 29.59 lakh ha (29.90%) of agriculture land (Anonymous, 2020) ^[1]. Gujarat has a diversified agricultural production system owing to its varied agro-climatic conditions and resource base. Farming systems in the state commonly combine crop cultivation with enterprises such as dairy, goat rearing, poultry, horticulture and fisheries, thereby providing opportunities for income diversification and efficient utilization of farm resources (Khadka *et al.*, 2014) ^[4]. In South Gujarat Navsari district receives the highest annual rainfall (1,864 mm). The district has a diversified farming system comprising paddy, sugarcane, mango, vegetables, fodder crops, livestock, fisheries and poultry. The diversity of farm enterprises and scope for resource recycling make Navsari district highly suitable for the adoption and promotion of Integrated Farming Systems (IFS).

Understanding farmers' perception of Integrated Farming Systems is the first step towards assessing their acceptance and adoption of the system, as perception significantly influences farmers' decisions and behaviour regarding sustainable farming practices. Farmers' perception may vary according to their socio-economic characteristics, as these characteristics determine their access to knowledge, resources, information and opportunities for interaction with extension agencies.

Present study aims to analyze the relationship between perception and farmers' socio-economic characteristics. By understanding farmers' perceptions and the factors influencing them, this study aims to generate valuable insights for the formulation of effective policies and programmes that promote the adoption and implementation of zero-waste farming systems in Navsari district of South Gujarat.

Objective

1. To study the relationship between profile characteristics of farmers and their perception towards Integrated Farming System
2. To determine the extent of variation caused by profile

characteristics on their perception towards Integrated Farming System using regression analysis

Methodology

The present study was conducted in Navsari district of South Gujarat in 2025-26, covering all six talukas. A multistage random sampling procedure was adopted, wherein two villages were randomly selected from each taluka, that makes total of 12 villages and 10 farmers were selected randomly from each village, resulting in a sample of 120 respondents. An *ex-post facto* research design was employed and primary data were collected from February 2026 to March 2026 through a well-structured interview schedule developed in accordance with the objectives of the study through farm and home visit. The study comprised eleven independent variables and one dependent variable, i.e., farmers' perception towards the Integrated Farming System (IFS).

The data was collected through personal interviews with the selected respondents and response obtained for each item in the interview schedule were scored and tabulated into an MS-Excel and analysed using SPSS software (version 26) and Python software (version 3.13). Statistical tools like mean, frequency, percentage, standard deviation, arbitrary method, Karl Pearson correlation, stepwise regression to draw conclusion. Karl Pearson's coefficient of correlation (r) was used to examine the relationship between the selected farmers' profile characteristics with their perception towards IFS, with significance tested at the 5 per cent and 1 per cent levels. Stepwise multiple regression analysis was employed to determine the extent of variation in farmers' perception explained by the selected independent variables.

Results and Discussion

Relationship between profile of farmers and their perception towards Integrated Farming System

The relationship of respondent profile *viz.* age, education, family size, farming experience, land holding, annual income, livestock possession, risk orientation, mass media utilization, extension participation and economic motivation and perception were ascertained with the help of Pearson correlation coefficient.

Table 1: Relationship between profile of farmers with their perception towards integrated farming system

Sr. No.	Independent variable	Coefficient of correlation (r)
1.	Age (X_1)	0.108 ^{NS}
2.	Education (X_2)	0.191*
3.	Family size (X_3)	0.0424 ^{NS}
4.	Farming experience (X_4)	0.338**
5.	Land holding (X_5)	0.211*
6.	Annual income (X_6)	0.261**
7.	Livestock possession (X_7)	0.428**
8.	Risk orientation (X_8)	0.410**
9.	Mass media utilization (X_9)	0.213*
10.	Extension participation (X_{10})	0.385**
11.	Economic motivation (X_{11})	0.292**

**Significant at 1% level of significance

*Significant at 5% level of significance

^{NS}Non-significant

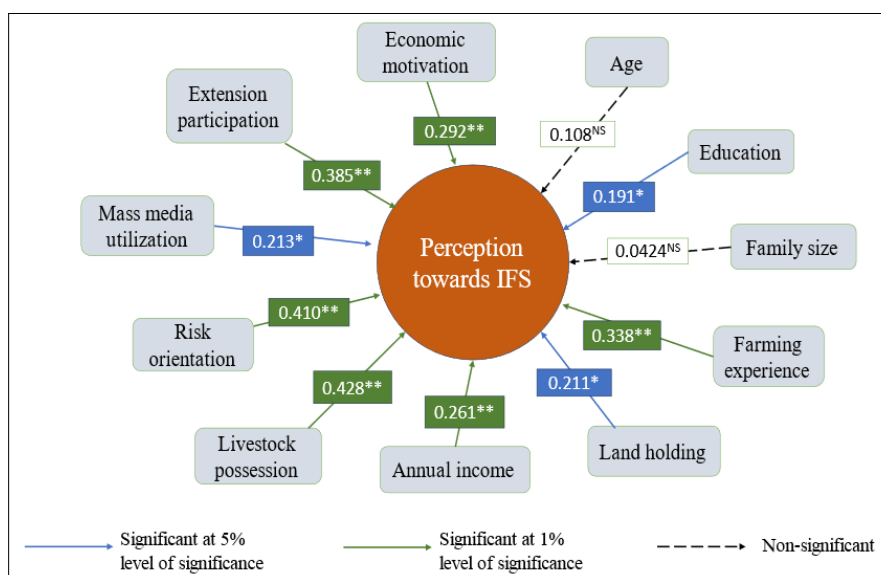


Fig 1: Correlation between profile characteristic of farmers with their perception towards IFS

Age and Perception

The data furnished in Table 1 revealed that age had positive and non-significant correlation with perception ($r = 0.108$). It shows that age does not have meaningful influence on the level of perception. Farmers across different age groups may face similar climatic, marketing and economic challenges which could explain the absence of significant association.

Education and Perception

The distribution in Table 1 suggests that education had positive and significant correlation with perception ($r = 0.191$) at 5 per cent level of significance. It indicates that Education forms the foundation for an improved standard of living. It enhances individuals' capacity to efficiently utilize available resources for their growth and development. Education makes farmers aware about new technologies, government schemes and better decision-making ability, thereby improve perception towards IFS.

Family size and Perception

The result shows in Table 1 that family size had positive and non-significant correlation with perception ($r = 0.0424$). The reason for non-significant relationship might be that large families may increase financial obligation but they can also provide additional labour support for farm activities. These balancing effects had contributed to the absence of significant relationship.

Farming experience and Perception

The result in Table 1 indicated that farming experience had positive and highly significant relationship with perception ($r = 0.338$) at 1 per cent level of significance. It reflects that greater farming experience is associated with higher perception of farmers. Experienced farmers had a deeper understanding of the limitations of monocropping and the risks associated with climate variability, pest outbreaks and market fluctuations. Over time, they realize the importance of diversification and sustainability.

Land holding and Perception

It can be observed from Table 1 that land holding had positive

and significant correlation with perception ($r = 0.211$) at 5 per cent level of significance. This highlighted that farmers with large land holding tends to higher level of perception towards IFS. Farmers with larger land holdings had greater flexibility to allocate land for different enterprises such as crops, livestock units, ponds and agroforestry. This spatial advantage allows them to effectively practice integration and experience its benefits.

Annual income and Perception

The distribution presented in Table 1 highlighted that annual income had positive and highly significant correlation with perception ($r = 0.261$) at 1 per cent level of significance. The finding indicate that higher income is associated with higher level of perception. Since IFS requires initial investment and management of multiple enterprises, financially stable farmers are more willing and capable of adopting such systems.

Livestock possession and Perception

The data presented in Table 1 revealed that livestock possession had positive and highly significant correlation with perception ($r = 0.428$) at 1 per cent level of significance. This signifies that farmers having higher livestock possession leads to higher level of perception. Farmers who already maintain livestock are more familiar with the principles of integration, such as recycling of farm waste (e.g., using dung as manure), utilization of crop residues as feed and generation of additional income. These farmers can clearly observe the interdependence between different farming components.

Risk orientation and Perception

It can be observed from Table 1 that risk orientation had positive and highly significant correlation with perception ($r = 0.410$) at 1 per cent level of significance. This highlights that farmers having high risk orientation had high level of perception towards IFS. As IFS is a diversified farming approach, it may initially appear complex and uncertain. However, farmers with a higher risk-taking ability are more open to trying such systems and exploring their benefits.

Mass media utilization and Perception

The result shown in Table 1 indicated that mass media utilization had positive and significant correlation with perception ($r = 0.213$) at 5 per cent level of significance. This shows that higher mass media utilization leads to higher level of perception. Farmers who frequently access television, radio, newspapers, mobile apps and the internet are more likely to be exposed to new technologies, success stories and government programs related to IFS. Hence, improves the perception towards IFS.

Extension participation and Perception

Table 1 depicts that extension participation had positive and highly significant correlation with perception ($r = 0.385$) at 1 per cent level of significance. This clearly demonstrates that frequently participating in extension program is associated with higher perception towards IFS. Farmers who actively participate in training programs, demonstrations, field visits and farmer meetings gain firsthand knowledge and practical exposure to IFS. These interactions with extension personnel and progressive farmers help them understand the technical and economic benefits of integration.

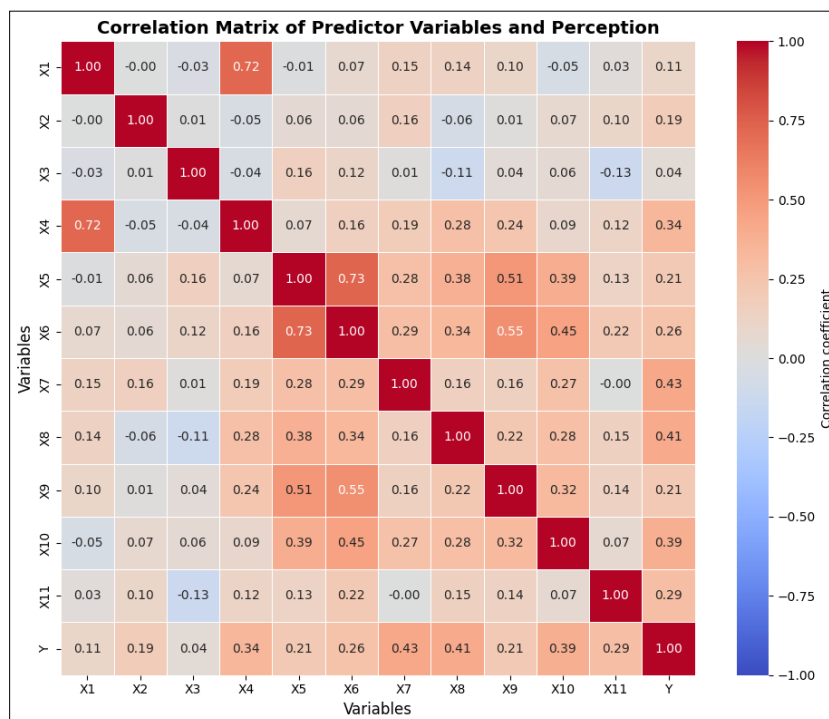


Fig 2: Correlation Matrix of Predictor Variables and Perception towards Integrated Farming System

Economic motivation and Perception

It is observed from Table 1 that economic motivation had positive and highly significant correlation with perception ($r = 0.292$) at 1 per cent level of significance. The findings imply that economic motivation significantly increase perception towards IFS. IFS offers multiple income-generating opportunities and ensures better resource utilization, economically motivated farmers are more inclined to appreciate its benefits. They are also more proactive in seeking new opportunities and adopting practices that enhance profitability.

Extent of variation caused by independent variables on the dependent variable

In behavioural sciences, a dependent variable is rarely influenced by a single independent variable alone; rather, it is affected by multiple independent variables operating jointly through their reciprocal and interactive relationships. To determine the individual contribution of each independent variable to the dependent variable, the effects of other variables were held constant. In this context, the stepwise regression analysis was performed using SPSS software. The results presented in the tables indicate that variables were introduced sequentially based on their respective contributions in explaining the variation in the dependent variable.

Table 2: Stepwise variation accounted by different independent variables on Perception towards Integrated Farming System

Model	Predictor variable	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	X ₇	0.428	0.183	0.176	14.40
2	X ₇ , X ₈	0.550	0.303	0.291	13.36
3	X ₇ , X ₈ , X ₁₁	0.601	0.361	0.345	12.84
4	X ₇ , X ₈ , X ₁₁ , X ₁₀	0.630	0.397	0.376	12.53
5	X ₇ , X ₈ , X ₁₁ , X ₁₀ , X ₄	0.651	0.424	0.399	12.30
X ₇ = Livestock possession		X ₁₀ = Extension participation			
X ₈ = Risk orientation		X ₄ = Farming experience			
X ₁₁ = Economic motivation					

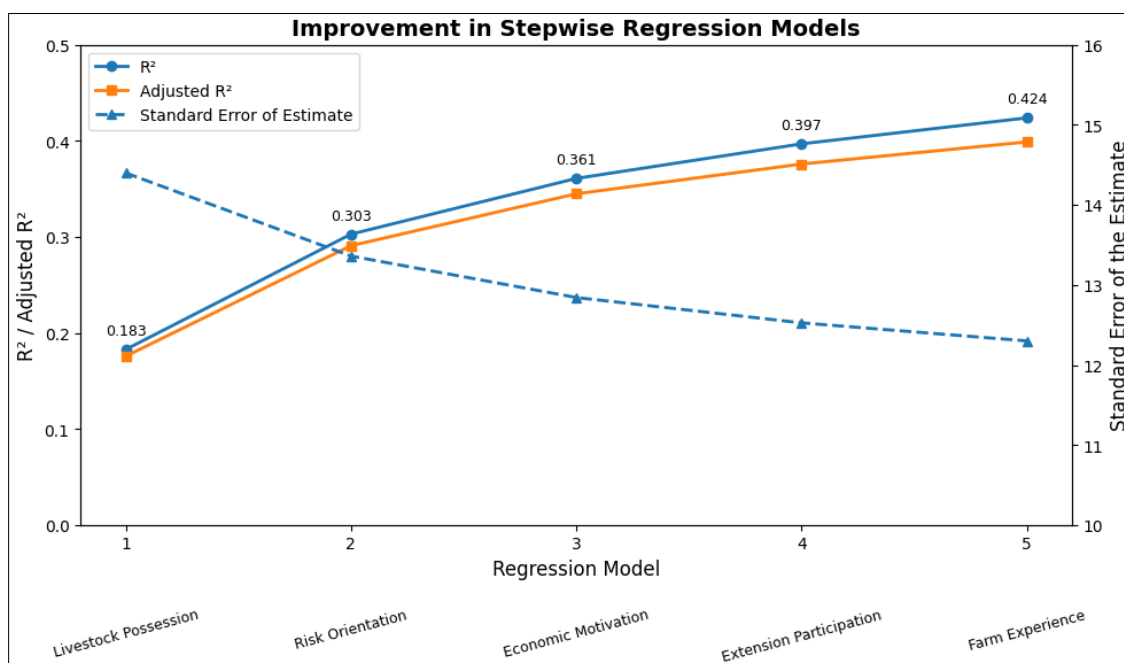


Fig 3: Improvement in Stepwise Regression Model Fit Across Successive Models

The stepwise multiple regression analysis revealed that five variables, namely livestock possession (X7), risk orientation (X8), economic motivation (X11), extension participation (X10) and farming experience (X4), were retained in the regression models as significant predictors of farmers' perception towards Integrated Farming System. Livestock possession entered first and accounted for 18.3 per cent of the variation in perception ($R^2 = 0.183$). With the subsequent entry of risk orientation, economic motivation, extension participation and farming experience, the coefficient of determination progressively increased to 0.303, 0.361, 0.397 and 0.424, respectively.

The final model comprising all five variables recorded an R value of 0.651 and an R^2 value of 0.424, indicating that the selected variables jointly explained 42.4 per cent of the

variation in farmers' perception towards IFS. The adjusted R^2 value of 0.399 indicated that the five selected independent variables jointly explained approximately 39.9 per cent of the variation in farmers' perception towards IFS after adjustment for the number of predictors in the model. The standard error of the estimate decreased progressively from 14.40 in Model 1 to 12.30 in the final model, indicating improved predictive accuracy with the inclusion of additional variables. The findings suggest that farmers possessing livestock, having greater risk orientation and economic motivation, participating more actively in extension activities and having greater farming experience tended to differ systematically in their perception towards IFS. The remaining 57.6 per cent of unexplained variation indicates the possible influence of other factors not included in the present regression model.

Table 3: Stepwise multiple regression analysis of independent variables and perception towards integrated farming system

Sr. No.	Independent variable	Partial regression coefficient (b)	Standard error	Multiple correlation coefficient 'R'	Adjusted R ²
	(Constant)	16.700	5.649	0.651	0.399
1.	Livestock Possession (X ₇)	6.762**	1.681		
2.	Risk Orientation (X ₈)	0.702**	0.249		
3.	Economic motivation (X ₁₁)	0.715**	0.231		
4.	Extension Participation (X ₁₀)	0.697**	0.253		
5.	Farming Experience (X ₄)	0.367*	0.160		

**Significant at 1% level of significance *Significant at 5% level of significance

Stepwise multiple linear regression analysis with eleven independent variables and perception as a dependent variable was carried out. The data regarding stepwise multiple regression are presented in Table 3.

The stepwise multiple regression analysis revealed that all five selected variables had a significant positive contribution to farmers' perception towards Integrated Farming System (IFS). Livestock possession emerged as the most important predictor, with a partial regression coefficient (b) of 6.762, significant at the 1 per cent level. Risk orientation (b = 0.702), economic motivation (b = 0.715) and extension participation (b = 0.697) also showed significant positive contributions at

the 1 per cent level, while farming experience (b = 0.367) had a significant positive contribution at the 5 per cent level. The final regression model recorded a multiple correlation coefficient (R) of 0.651 and an adjusted R^2 of 0.399, indicating that the selected variables jointly explained approximately 39.9 per cent of the variation in farmers' perception towards IFS. The positive regression coefficients suggest that an increase in these characteristics was associated with a corresponding increase in farmers' perception towards IFS, with livestock possession showing the largest regression coefficient among the variables studied.

Conclusion

The study revealed that education, farming experience, land holding, annual income, livestock possession, risk orientation, mass media utilization, extension participation and economic motivation had positive and significant relationship with perception. Hence, extension agencies should identify and prioritize farmers with higher potential in these attributes to act as community resource persons or lead farmers. The study further revealed that five independent variables namely, farming experience, livestock possession, risk orientation, extension participation and economic motivation were accounting influence on perception towards integrated farming system. To improve the farmers perception and effective implementation of integrated farming system extension services need to be strengthened through regular field visits, organization of training programmes, farmer field schools and exposure visits to successful IFS units. Policies should focus on increasing the profitability of IFS by providing financial incentives, subsidies and easy access to credit facilities. Strengthening market infrastructure and promoting farmer producer organizations (FPOs) can further enhance income opportunities.

Conflict of Interest

There is no conflict of interest among any authors regarding publication of the research paper in the journal as well as in the content.

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