

## International Journal of Agriculture Extension and Social Development

Volume 9; Issue 7; July 2026; Page No. 878-882

Received: 14-05-2026  
Accepted: 17-06-2026

Indexed Journal  
Peer Reviewed Journal

### Factors influencing the establishment of agro tourism centres: A logistic regression approach

PV Phadte<sup>1</sup>, PJ Kshirsagar<sup>2</sup>, SR Torane<sup>3</sup>, SA Jagtap<sup>4</sup> and RA Kolamkar<sup>5</sup>

<sup>1</sup>Ph.D Scholar, Department of Agricultural Economics, D.B.S.K.K.V, Dapoli, Maharashtra, India

<sup>2</sup>Associate Professor, Department of Agricultural Economics, D.B.S.K.K.V, Dapoli, Maharashtra, India

<sup>3</sup>Head and Professor, Department of Agricultural Economics, D.B.S.K.K.V, Dapoli, Maharashtra, India, Maharashtra, India

<sup>4</sup>Ph.D. Scholar, Department of Agricultural Economics, D.B.S.K.K.V, Dapoli, Maharashtra, India

<sup>5</sup>Assistant Professor, Department of Agricultural Economics, Goa College of Agriculture, Ela Farm, Old Goa, India

DOI: <https://www.doi.org/10.33545/26180723.2026.v9.i7l.3967>

Corresponding Author: PV Phadte

#### Abstract

The present study was undertaken to examine the factors influencing the establishment of Agro tourism centres (ATCs) in the study area. Understanding these factors is essential to identify the key drivers and barriers affecting the establishment of Agro tourism centre. The study was based on primary data collected from 90 Agro tourism centre owners and 90 non-ATC farmers selected randomly from Goa and the Konkan region of Maharashtra. Logistic regression analysis was employed to identify the factors influencing the establishment of Agro tourism centres. The analysis was performed using the SPSS software. The results revealed that annual income from off-farm business, distance from the main road, distance from the nearby tourist spot, availability of amenities, start-up capital availability, area under plantation crops and farming experience significantly influenced the establishment of Agro tourism centres. These results suggested that improving access to start-up finance, strengthening infrastructure and visitor amenities and promoting plantation-based tourism resources can play a significant role in encouraging the establishment and sustainable growth of Agro tourism enterprises.

**Keywords:** Agro tourism centres, logistic regression, factors, Goa, Konkan region

#### Introduction

Agritourism is the incorporation of tourism with agriculture. It promotes agriculture and allied activities as a tourism product. Agri-tourism is a rural enterprise which incorporates an operational farm along with a commercial tourism element. Agro-tourism can be considered as a dominant diversification option for sustaining viability of the agricultural sector. Agro tourism not only benefit the farmers but mutually benefit the society. It creates employment to the rural people, preserves agricultural traditions and heritage, promote local food systems and enables tourists to learn the sustainable farming methods. Overall Agro tourism promotes the socio-economics and sustainable development.

Agritourism is increasingly recognized as an important strategy that can contribute to agricultural development through diversification of farming activities. At present, agritourism is promoted by most of the countries in the world aiming at sustainable rural development. Further, agritourism can also be explained as a holiday concept of visiting an agribusiness operation for the purpose of enjoyment, education or involvement in the activities of the operation. However, the establishment of Agro tourism centres is influenced by several socio-economic, infrastructural, financial, and institutional factors, which vary across regions and among entrepreneurs.

The decision to establish an Agro tourism centre is not solely determined by the availability of agricultural land or farm, but also depends on factors such as the farmer's education, farming experience, landholding size, income, accessibility, availability of amenities, investment capacity, entrepreneurial skills, and proximity to tourist attractions. Understanding these factors is essential to identify the key drivers and barriers affecting the establishment of Agro tourism enterprises. Such knowledge helps explain why some farmers successfully diversify into Agro tourism while others continue to rely exclusively on conventional farming. Therefore, analysing the factors influencing the establishment of Agro tourism centres is crucial for developing effective policies and support mechanisms to promote this enterprise. The findings provide valuable insights for policymakers, extension agencies, financial institutions and prospective entrepreneurs in designing location-specific strategies, improving rural infrastructure, facilitating access to finance, and strengthening entrepreneurial capacity.

#### Materials and Method

The present study was based on primary data collected from 90 Agro tourism centre (ATC) owners and 90 non-ATC farmers from Goa and the Konkan region of Maharashtra. In

the Konkan region, 60 ATC owners and 60 non-ATC farmers were randomly selected from the five districts of Sindhudurg, Ratnagiri, Raigad, Thane, and Palghar, while in Goa, 30 ATC owners and 30 non-ATC farmers were randomly selected from the two districts, namely North Goa and South Goa. Thus, a total of 180 respondents were selected for the study and the required data were collected through the survey method using a pre-tested structured questionnaire

### Analytical tools

To understand the factors influencing establishment of Agro tourism centres, logistic regression analysis was carried out as given below:

### Logistic regression analysis

Logistic regression (LR) is a statistical analysis tool for modelling the relationship between a response variable and a set of explanatory variables when the response variable is categorical. Logistic regression does not have the requirements for the independent variables to be normally distributed, linearly related or of equal variance within each group.

The establishment of an ATC is a discrete choice outcome i.e dependent variable is dichotomous therefore; logistic regression is appropriate as it estimates the probability of occurrence of a binary event based on a set of explanatory variables.

A total of fourteen explanatory variables were included in the model based on review of literature, field observations and logical relevance to Agro tourism development:

### Y= whether farmer is an ATC entrepreneur or not

If Yes=1, if No=0

$X_i$  are independent variables:

$X_1$  = Age (years)

$X_2$  = Education level

$X_3$  = Annual Income from farm business (Rs.)

$X_4$  = Income from off farm business (Rs.)

$X_5$  = Distance from main Road (Km)

$X_6$  = Farming Experience (years)

$X_7$  = Land holding size (ha)

$X_8$  = Distance from nearby tourism spot (km)

$X_9$  = Labour availability

$X_{10}$  = Available amenities

$X_{11}$  = Green technology adoption

$X_{12}$  = Electricity supply issue

$X_{13}$  = startup capital

$X_{14}$  = % area under plantation crops

In order to predict the probability of the dependent variable and to apply logistic transformation, the probability function can be written as Equation 1, where  $p$  represent the probability of occurrence of an event and  $1-p$  is the probability of non-occurrence of an event.

$$\frac{p}{1-p} = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \dots + \beta_n X_n + \mu \quad \dots \dots \dots (1)$$

The logit transformation equation

$$\text{Logit } p = \ln \left( \frac{p}{1-p} \right) \dots \dots \dots (2)$$

After logit transformation is applied the equation becomes;

$$\ln \frac{p}{1-p} = \ln(\beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \dots + \beta_n X_n + \mu) \dots \dots \dots (3)$$

After applying the logit transformation, we derive an equation expressing the relationship in term of predictor variable and coefficients. By solving this transformed equation, we arrived at the logistic regression (LR) model which predict the probability of  $Y$  occurring as given in equation 4.

$$P(Y) = \frac{1}{1 - e^{-(\beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \dots + \beta_n X_n + \mu)}} \dots \dots \dots (4)$$

Where,  $P(Y)$  = probability of  $Y$  occurring;  $e$  is the base of natural logarithm and  $\beta_0$  represents exposure variable or constant,  $\beta_1 \dots n$  are the coefficients, and  $X_1 \dots n$  are the independent (predictor) variables.

In logistic regression, the dependent variable is coded to distinguish the difference between occurrence and non-occurrence of an event. Assigning a value of 1 ( $Y=1$ ) to event occurrence and 0 ( $Y=0$ ) to non- occurrence of the event is the simplest coding for the dependent variable.

The parameters of the model were estimated using the SPSS software. The sign and significance of the estimated coefficients indicate the direction and strength of influence of each factor on the probability of establishment of ATCs. To facilitate interpretation, the estimated coefficients were converted into odds ratios using the exponential function. An odds ratio greater than unity implies that the corresponding variable increases the likelihood of establishing an ATC, while a value less than unity indicates a negative influence. The overall significance and goodness of fit of the model were evaluated using the appropriate test. Variables with statistically significant coefficients were considered as the major determinants responsible for the establishment of Agro-Tourism Centres in the study region.

### Result

The result of logistic regression model is presented below.

### Omnibus tests of model coefficients

Table 1. Represent the Omnibus test which was used to assess the overall significance of LP model. It tests whether the inclusion of the independent variable significantly improves the model's ability to predict the dependent variable compare to a model containing only the intercept. It was observed from the Table 1 that the omnibus test yielded a chi-square value of 179.08, which was statistically significant indicated that, the logistical regression model provides a substantially better and set of independent variables collectively contributed to explain the establishment of ATC.

**Table 1:** Omnibus tests of model coefficients

|        |       | Chi-square | df | Sig. |
|--------|-------|------------|----|------|
| Step 1 | Step  | 179.083    | 14 | .001 |
|        | Block | 179.083    | 14 | .001 |
|        | Model | 179.083    | 14 | .001 |

### Model summary

The Model summary was depicted in Table 2 which provided the measures to assessed the goodness of fit and explanatory power of the logistic regression model. To understand how

well the model fits the observed data the -2 log likelihood was used. The -2 log likelihood value was 70.45, which indicated that the fitted model adequately explained the observed data. The Cox and Snell R Square and Nagelkerke R square also estimated which indicated the proportion of variation in the dependent variable explained by the independent variables. The Cox & Snell R square was 0.63 and Nagelkerke R square was 0.84, which were good indicators to model fit. The estimation terminated at iteration number 8 because parameter estimates changed by less than .001 note indicate that the maximum likelihood estimation procedure was successfully converged after eight iterations. This confirmed that the regression coefficient was estimated reliably and that the final model was stable and suited for interpretation of independent predictor variables.

**Table 2:** Model summary

| Step                                                                                                            | -2 Log likelihood   | Cox & Snell R Square | Nagelkerke R Square |
|-----------------------------------------------------------------------------------------------------------------|---------------------|----------------------|---------------------|
| 1                                                                                                               | 70.450 <sup>a</sup> | 0.630                | 0.840               |
| <b>Note:</b> Estimation terminated at iteration number 8 because parameter estimates changed by less than .001. |                     |                      |                     |

### Hosmer and Lemeshow Test

Hosmer and Lemeshow statistic was used to assess the goodness of fit of the logistic regression model by comparing the observed and predicted probabilities of the dependent variable. The non-significance results predicted that there was no significant difference between the observed and predicted values, indicated that the logistic regression model was fitted the data satisfactorily.

**Table 3:** Hosmer and Lemeshow test

| Step | Chi-square | df | Sig.  |
|------|------------|----|-------|
| 1    | 4.880      | 8  | 0.770 |

### Classification table

The Classification Table evaluated the predictive accuracy of the logistic regression model by comparing the observed outcomes with the predicted outcomes based on a cut-off probability of 0.500. The Table 4. shows the classification table and the results revealed that, out of 90 observed non-established Agro tourism centres (ATC = 0), the model correctly classified 85 cases, while 5 cases were misclassified, resulting in a classification accuracy of 94.4 per cent. Similarly, out of 90 observed established Agro tourism centres (ATC = 1), the model correctly classified 82 cases, whereas 8 cases were incorrectly classified, giving a prediction accuracy of 91.1 per cent.

Overall, the logistic regression model achieved a classification accuracy of 92.8 per cent, indicating that it correctly predicted the establishment status of Agro tourism centres in nearly 93 out of every 100 cases. The high overall percentage of correctly classified observations demonstrates that the fitted logistic regression model possesses excellent predictive ability and is reliable for identifying the factors influencing the establishment of Agro tourism centres in the study area.

**Table 4:** Classification table

|        | Observed           | Predicted |      |
|--------|--------------------|-----------|------|
|        |                    | ATC       |      |
|        |                    | 0         | 1    |
| Step 1 | ATC                | 0         | 85 5 |
|        |                    | 1         | 8 82 |
|        | Overall Percentage |           | 92.8 |

### Variables in the equation

Table 5. Represent the result of the binary logistic regression analysis conducted to identify the factors influencing the establishment of Agro tourism centre in the study area. The estimated regression coefficients (B), significance levels, odds ratios [Exp(B)] was presented in the table.35

The results revealed that annual income from off-farm business, distance from the main road, distance from the nearby tourist spot, availability of amenities, start-up capital availability, and area under plantation crops significantly influenced the establishment of Agro tourism centres.

The coefficient for annual income from off-farm business was positive and highly significant ( $B = 0.917$ ;  $p < 0.01$ ). The estimated odds ratio [ $\text{Exp}(B) = 2.503$ ] indicates that an increase in annual off-farm income increases the likelihood of establishing an Agro tourism centre by 2.503 times, suggesting that additional financial resources enable entrepreneurs to invest in tourism infrastructure and related facilities.

**Table 5:** Variables in the equation

|                 | Variables                              | B                     | Exp(B) |
|-----------------|----------------------------------------|-----------------------|--------|
| X <sub>1</sub>  | Age (years)                            | 0.045<br>(0.04)       | 1.046  |
| X <sub>2</sub>  | Education                              | 0.148<br>(0.09)       | 1.160  |
| X <sub>3</sub>  | Annual income from farm business       | 0.001<br>(0.01)       | 1.000  |
| X <sub>4</sub>  | Annual income from off farm business   | 0.917 ***<br>(0.12)   | 2.503  |
| X <sub>5</sub>  | Distance from the main road (Km)       | -0.772 ***<br>(0.28)  | 0.462  |
| X <sub>6</sub>  | Farming Experience                     | -0.088*<br>(0.48)     | 0.916  |
| X <sub>7</sub>  | Land holding (Ha)                      | -0.059<br>(0.08)      | 0.943  |
| X <sub>8</sub>  | Distance from nearby tourist spot (Km) | 0.123***<br>(0.03)    | 1.131  |
| X <sub>9</sub>  | Labour availability                    | 0.665<br>(0.74)       | 1.944  |
| X <sub>10</sub> | Available amenities                    | 2.422***<br>(0.71)    | 11.270 |
| X <sub>11</sub> | Green technology adoption              | -0.955<br>(0.86)      | 0.385  |
| X <sub>12</sub> | Electricity supply issue               | 0.818<br>(0.79)       | 2.266  |
| X <sub>13</sub> | Startup capital availability           | 1.682 **<br>(0.75)    | 5.374  |
| X <sub>14</sub> | % area under plantation crops          | 0.038 **<br>(0.01)    | 1.039  |
|                 | Constant                               | -11.730 ***<br>(3.01) | 0.001  |

(\*, \*\* and \*\*\* indicates significance at 10, 5 and 1 per cent level, respectively) (figures in parenthesis indicates standard error)

The distance from the main road exhibited a negative and significant relationship with the establishment of Agro tourism centres ( $B = -0.772$ ;  $p < 0.01$ ). The odds ratio [ $\text{Exp}(B) = 0.462$ ] implies that an increase in the distance from the main road reduces the likelihood of establishing an Agro tourism centre by approximately 53.8 per cent. This indicates that easy accessibility is an important determinant for attracting tourists and promoting Agro tourism.

The variable distance from the nearby tourist spot had a positive and statistically significant influence on the establishment of Agro tourism centres ( $B = 0.123$ ;  $p < 0.01$ ). The estimated odds ratio [ $\text{Exp}(B) = 1.131$ ] indicates that with every one-kilometre increase in distance from a nearby tourist spot, the odds of establishing an Agro tourism centre increase by 13.1 per cent. This revealed that the Agro tourism centres were often established at locations slightly away from major tourist attractions, where agricultural land is more readily available and the natural rural environment could be preserved. Moreover, many tourists visiting Agro tourism centres prefer peaceful, scenic, and less crowded destinations that provide relaxation and an authentic farm experience rather than congested tourist locations.

The estimated coefficient for farming experience was negative and statistically significant at the 10 per cent level ( $B = -0.088$ ;  $p = 0.064$ ). The corresponding odds ratio [ $\text{Exp}(B) = 0.916$ ] indicates that, each additional year of farming experience decreases the likelihood of establishing an Agro tourism centre by approximately 8.4 per cent. The negative coefficient indicates that farmers with greater farming experience are more likely to continue conventional agricultural practices than establish Agro tourism centres. In contrast, those with comparatively less farming experience are more inclined to diversify their farm enterprises by adopting Agro tourism.

The variable availability of amenities had a positive and highly significant effect ( $B = 2.422$ ;  $p < 0.01$ ). The odds ratio [ $\text{Exp}(B) = 11.270$ ] indicates that Agro tourism centres equipped with adequate amenities were 11.27 times more likely to be established than those lacking such facilities. This highlighted the critical role of infrastructure and visitor facilities in the successful establishment of Agro tourism enterprises.

Similarly, start-up capital availability exerted a positive and significant influence on the establishment of Agro tourism centres ( $B = 1.682$ ;  $p < 0.05$ ). The corresponding odds ratio [ $\text{Exp}(B) = 5.374$ ] indicates that respondents with adequate start-up capital were 5.37 times more likely to establish an Agro tourism centre than those with limited financial resources.

The percentage area under plantation crops also showed a positive and statistically significant effect ( $B = 0.038$ ;  $p < 0.05$ ). The odds ratio [ $\text{Exp}(B) = 1.039$ ] indicates that every one per cent increase in the area under plantation crops increases the likelihood of establishing an agro-tourism centre by 3.9 per cent. Plantation crops such as coconut, arecanut, cashew, and mango enhance the aesthetic appeal of farms and provide opportunities for farm-based tourism activities thereby encouraging the development of Agro tourism.

The variables age, education, farm income, farming experience, land holding, labour availability, green technology adoption, and electricity issues were not found to

have a statistically significant influence on the establishment of Agro tourism centres ( $p > 0.05$ ). Although some of these variables showed positive or negative coefficients, their effects were not sufficiently strong to significantly affect the probability of establishing Agro tourism enterprises in the study area. Overall, the findings indicate that financial capacity, accessibility, tourism-related infrastructure, and the availability of plantation-based resources are the major determinants influencing the establishment of Agro tourism centres.

These results suggest that improving access to start-up finance, strengthening infrastructure and visitor amenities and promoting plantation-based tourism resources can play a significant role in encouraging the establishment and sustainable growth of Agro tourism enterprises.

## Conclusion

Agro-tourism has emerged as an important strategy for diversifying farm income, generating rural employment, and promoting sustainable rural development by integrating agriculture with tourism. However, the establishment of Agro tourism centres depends on several socio-economic, infrastructural, and entrepreneurial factors that influence farmers' decisions to adopt this enterprise. Logistic regression results revealed that annual income from off-farm business, distance from the main road, distance from the nearby tourist spot, availability of amenities, start-up capital availability and area under plantation crops, farming experience significantly influenced the establishment of Agro tourism centres. This suggested that better financial capacity, improved accessibility and adequate amenities encourage farmers to diversify into Agro tourism, while farming experience showed a negative influence, suggesting that relatively younger or less experienced farmers are more inclined to adopt Agro tourism as an entrepreneurial venture. The overall model demonstrated good explanatory and predictive ability, highlighting the importance of strengthening rural infrastructure, improving access to finance, and promoting entrepreneurship through training and policy support to encourage the establishment of Agro tourism centres and foster sustainable rural development.

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