ROLE OF AI IN FARM-TOURISM(AGRI-TOURISM) AT NEREDUCHERLA MANDAL OF SURYAPET DISTRICT-AN EMPIRICAL STUDY.

Abstract

"Farm tourism is a form of rural tourism that occurs on farms where tourists engage with farm activities, learn about agricultural practices, and experience the rural lifestyle, thereby providing additional income to farmers. This study is based on an empirical investigation of a sample of **112** farmers from NereducherlaMandal of Suryapet District, focusing on farm tourism and related agricultural practices. Agri-tourism combines agriculture and tourism to promote rural development, allowing visitors to experience farming activities and rural life. The study examines how Artificial Intelligence (AI) is transforming traditional farming through technologies such as crop monitoring, pest detection, precision farming, and smart irrigation, enhancing both farm productivity and sustainability. It also explores farm visits as part of the research methodology, using purposive sampling to select participants actively engaged in or familiar with farm tourism. AI not only assists farmers in effective farm management but also creates educational experiences for tourists, while supporting digital marketing, quality control, and operational efficiency. The findings indicate that AI can increase farmers' income, promote sustainable practices, and generate rural employment, though challenges such as limited awareness, high costs, and technological constraints remain. Overall, integrating AI with farm tourism in NereducherlaMandal has significant potential to advance rural economic development and modernize agricultural practices.

Keywords: Agri-tourism, Farm Tourism, Artificial Intelligence (AI), Smart Farming, NedcherlaMandal, Tourists

Introduction

Agriculture has traditionally been the cornerstone of rural economies in India, providing livelihoods to millions of people and shaping the socio-economic structure of villages. In recent years, the concept of agri-tourism has emerged as an innovative approach to enhance rural development by combining agricultural practices with tourism activities. Agri-tourism allows visitors to experience the life of farmers, participate in farming activities, and gain knowledge about crop cultivation, livestock management, and rural culture. This model not only diversifies income for farmers but also strengthens rural employment opportunities and promotes sustainable agricultural practices. Phillip et al. (2010): "Agri-tourism is a form of niche tourism in which visitors engage with agricultural operations, learn about rural life, and participate in farm-based experiences, contributing to the socio-economic development of rural communities."The integration of Artificial Intelligence (AI) into agriculture is revolutionizing traditional farming methods. Technologies such as precision farming, AI-

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based pest and disease detection, smart irrigation systems, and digital crop monitoring enable farmers to optimize resource usage, improve crop yields, and manage farms more efficiently. In the context of agri-tourism, AI adds a new dimension by creating educational and experiential opportunities for tourists. Visitors can witness AI tools in action, learn about modern farming techniques, and participate in interactive farm activities, making the farm tourism experience more engaging and informative.

Review of Literature

Agri-Based Tourism Reviews

1. Rauniyar, Subedi, and Joshi (2021) provided a global perspective on agritourism, emphasizing its capacity to combine agricultural production with tourism activities, creating income opportunities and cultural exchange.
2. Somanath (2021) examined the Indian context, noting that agritourism enables farmers to showcase crops, local food production, and traditional practices, while educating visitors about rural livelihoods.
3. Sinha and Ali (2024) highlighted the growing demand for agritourism, stressing the need for infrastructure development, awareness campaigns, and strategic promotion to sustain rural income benefits.
4. Dsouza, Shetty, and Prasad (2024) argued that integrating agritourism into the broader rural economy can protect cultural traditions, promote local products, and enhance environmental sustainability.
5. Mahida (2023) emphasized the experiential aspect of agritourism, where visitors gain hands-on exposure to crop cultivation, farm processing, and cultural practices, leading to enhanced rural employment and awareness about sustainable agriculture. Collectively, these studies underscore that agri-based tourism is not just an economic activity but a means to preserve agricultural heritage and educate visitors.

Farm-Based Tourism Reviews

6. Jincy and Reshmi (2022) explored farm tourism in Kerala, emphasizing that visitor satisfaction is closely linked to service quality, interactive experiences, and farm participation.
7. Gupta and Sharma (2021) found that activities such as fruit picking, animal feeding, and guided farm tours significantly enhance tourist engagement and retention.
8. Somanath (2021) and Sinha and Ali (2024) highlighted the operational challenges of farm tourism, including the need for farmer training, proper infrastructure, and market-oriented planning.
9. Mahida (2023) further stressed the educational role of farm tourism, noting that tourists not only enjoy recreation but also learn about modern and traditional farming techniques. Farm-based tourism thus emerges as a critical tool for rural livelihood diversification, cultural preservation, and interactive learning, strengthening the socio-economic resilience of rural communities.

AI-Based Tourism and Agriculture Reviews

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10. Suanpang and Pothipasa (2021) introduced AI-based agrotourism systems, highlighting how AI can personalize visitor experiences, optimize itineraries, and enhance satisfaction.
11. Reddy and Narayan (2022) examined AI applications in Telanganaagritourism, demonstrating that smart irrigation, crop monitoring, and visitor engagement platforms improve farm productivity while educating tourists.
12. Sueblo, Garcia, and Kim (2025) emphasized that AI-driven precision agriculture enables real-time insights into crop growth and environmental conditions, allowing farms to offer interactive learning experiences.
13. Mashapure (2025) addressed the challenges of AI adoption, noting technological costs, ethical considerations, and labor displacement as potential barriers.
14. Li (2021) highlighted AI applications in smart tourism, such as chatbots and recommendation systems, which can be adapted for farm tourism to enhance user engagement. These studies collectively suggest that AI integration can improve operational efficiency, enrich visitor experiences, and make farm tourism more sustainable and attractive.

Farmer-Focused Reviews

15. Somanath (2021) noted that farmer participation in planning and managing tourism activities is critical to maximize benefits.
16. Gupta and Sharma (2021) argued that training farmers in hospitality, visitor interaction, and safety protocols significantly improves tourist satisfaction.
17. Mahida (2023) highlighted that farmers gain economic empowerment, skill enhancement, and community recognition through tourism initiatives.
18. Mashapure (2025) warned that integrating AI into farms requires farmer awareness and technical support to avoid exclusion or displacement. Overall, the literature emphasizes that farmers' involvement, capacity building, and adaptation to technology are key determinants of sustainable agritourism and farm tourism development.

Tourism-Based Reviews

19. Rauniyar, Subedi, and Joshi (2021) and Sinha and Ali (2024) demonstrated that agritourism diversifies rural tourism offerings, attracting urban tourists seeking cultural, educational, and recreational experiences.
20. Jincy and Reshmi (2022) highlighted the importance of service quality and tourist engagement in ensuring repeat visits.
21. Li (2021) emphasized the role of technology, particularly AI, in creating personalized tourism experiences.
22. Singh and Verma (2023) noted that agritourism can strengthen regional tourism infrastructure, generate rural employment, and promote sustainable travel practices.

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Tourism-based research thus underscores the symbiotic relationship between visitor experience and rural development.

NereducherlaMandal and Region-Specific Reviews

23. Reddy and Narayan (2022) highlighted the application of AI in agritourism in Telangana, suggesting its potential to modernize rural farming practices and attract tourists. Local agricultural studies indicate that Nereducherla, with its fertile lands for paddy, cotton, and seasonal crops, is suitable for agritourism and farm tourism initiatives
24. Somanath, (2021). Mahida (2023) suggested that region-specific cultural and agricultural experiences can enhance visitor engagement, while AI and digital tools can provide real-time farm insights, making Nereducherla an ideal candidate for experimental agritourism models. These region-focused insights indicate the potential of targeted interventions to boost rural economy, farmer income, and tourist satisfaction.

Research Gap

- Despite extensive research on agritourism, farm tourism, and the integration of AI in agriculture, significant gaps remain, particularly in region-specific contexts like NereducherlaMandal.
- Most studies focus on national or global perspectives, leaving limited empirical evidence on the practical impact of AI on farm productivity and tourist experiences at the local level.
- Lack of research on farmers' perceptions, readiness, and challenges in adopting AI-based tourism practices.
- AI's potential to enhance operational efficiency and visitor engagement is highlighted, there is insufficient focus on its socio-economic effects, such as income generation, rural employment, and sustainable agricultural practices.
- Region-specific studies exploring cultural, agricultural, and tourism integration in Telangana are sparse. Capacity-building, technological awareness, and training for farmers in AI adoption remain underexplored, and few studies address how AI-enabled farm tourism can balance educational, recreational, and economic outcomes. There is a need for an empirical, localized study that links AI, farm tourism, and rural development in NereducherlaMandal to fill these knowledge gaps.

Objectives of the study

1. To examine the role of AI in enhancing farm productivity and tourist experiences in NereducherlaMandal.
2. To analyze farmers' perceptions, challenges, and readiness towards integrating AI in farm tourism activities.

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3. To assess the impact of AI-enabled farm tourism on rural livelihoods, economic development, and sustainable agricultural practices.

Hypotheses of the study

H_0 1: Adoption of AI technologies in farm operations is positively associated with increased farm productivity and improved tourist experiences.

activities.

H_0 2 : Farmers with higher awareness and positive perceptions of AI are more likely to adopt AI-enabled farm tourism practices.

H_0 3: AI-enabled farm tourism has a significant positive impact on farmers' income, employment generation, and adoption of sustainable agricultural practices.

Theoretical Background

The study of agritourism and farm tourism in conjunction with Artificial Intelligence (AI) is grounded in several interrelated theoretical frameworks that explain the socio-economic, technological, and behavioral dimensions of rural tourism development. First, the Sustainable Livelihoods Theory (Chambers & Conway, 1992) provides a foundational perspective, emphasizing how rural households diversify income sources to enhance economic security. In the context of agritourism, farmers leverage tourism activities alongside traditional agriculture to generate additional income, improve resource utilization, and strengthen community resilience. The integration of AI technologies, such as precision farming, smart irrigation, and crop monitoring, aligns with this theory by improving farm productivity and sustainability while creating new tourism-related income streams.

Second, the Innovation Diffusion Theory (Rogers, 2003) is particularly relevant for understanding how AI adoption occurs among farmers and tourism operators. This theory explains the process by which new technologies are communicated, adopted, and implemented within a social system. In agritourism, AI tools such as digital marketing platforms, AI-driven visitor management systems, and precision agriculture applications represent innovations whose adoption depends on factors like perceived benefits, complexity, observability, and social influence. Understanding farmers' readiness, awareness, and willingness to adopt these technologies is central to analyzing the success of AI-enabled farm tourism in NereducherlaMandal.

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Third, the study draws on Tourism Experience and Experiential Learning Theory (Pine & Gilmore, 1999), which suggests that tourism value is enhanced when visitors actively engage in authentic, hands-on experiences. Farm tourism inherently provides such interactive experiences—crop cultivation, animal care, and cultural participation—while AI can augment these experiences by offering real-time information, personalized guidance, and immersive learning opportunities. This theoretical lens helps explain the dual benefit of farm tourism: it educates visitors and simultaneously provides farmers with enhanced operational and marketing tools.Rural Development and Community-Based Tourism Framework (Sharpley& Roberts, 2004) contextualizes agritourism and farm tourism as catalysts for regional economic growth. This framework emphasizes that tourism activities in rural areas should be integrated with local agriculture, culture, and natural resources to promote sustainable development. In NereducherlaMandal, the combination of AI, farm-based tourism, and cultural-agricultural engagement can support rural employment, improve income, and encourage environmentally sustainable practices, consistent with the principles of community-based rural development.

Research methodology

Research Design

The study follows a mixed-method approach, integrating both quantitative and qualitative data collection techniques to analyze the impact of AI in Farm Tourism(Agri-tourism).

- **Nature of the Study:** The present study is empirical and descriptive in nature
- **Sources of Data**
    - **Primary Data:** Collected directly from farmers in NereducherlaMandal, using structured questionnaires covering demographics, AI awareness, AI adoption, farm tourism practices, and socio-economic outcomes.
    - **Secondary Data:** Collected from published literature, research articles, government reports, and official statistics on agriculture, tourism, and AI doption in rural Telangana.
- **Sample Size:** The study was conducted on a sample of 112
- **Sampling Technique:** The study adopted purposive sampling, selecting farmers
- **The sampling frame:** consisted of all registered farmers and farm tourism operators in NereducherlaMandal, obtained from local agricultural offices, farmer cooperatives, and tourism associations.

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- **Statistical Tools Applied:** Mean, standard deviation, and frequency distributions for demographic variables and survey responses.
- **Inferential Statistics:** Pearson Correlatio, Simple Linear Regression
- **Limitations of the Study**
    - The study is limited to NereducherlaMandal, so results may not be generalizable to other regions.
    - Sample Size: Only 112 farmers were surveyed; larger samples could provide more robust results.
    - Time is one of the Constraint
    - Limited access to advanced AI tools and tourism data constrained a more detailed technological assessment.

Data Analysis and interpretation

Tab: Demographic Divide

Demographic Variable	Category	Frequency (f)	Percentage (%)
Age	Below 25	10	46
	26–35	31	25
	36–45	47	13
	46–55	18	64
	Above 55	6	36
Gender	Male	87	38
	Female	25	62
Education Level	No formal education	19	46
	Primary	22	25
	Secondary	39	13
	Graduate	31	64
	Postgraduate	1	36
Farming Experience	Less than 5 years	12	38
	5–10 years	25	62
	11–20 years	45	46
	Above 20 years	30	25
Farm Size	Less 1 acre	18	13
	1–3 acres	52	64
	4–6 acres	28	36
	Less than 6 acres	14	38
Involvement in Farm Tourism	Yes	72	62
	No	40	46
Use of AI in Farming	Yes	43	25
	No	69	13

Source: Primary Data

Interpretation

- **Age:**The majority of respondents (42%) are aged 36–45 years, followed by 26–35 years (28%). Farmers below 25 years (9%) and above 55 years (5%) form a small portion of the sample. The dominant age group is in the mid-career stage, suggesting they are experienced in farming and potentially open to adopting AI and participating

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in farm tourism. Younger farmers are few, which may affect the long-term sustainability of AI adoption if youth engagement is not encouraged.

- **Gender:** 78% of respondents are male and 22% are female. Farm management and decision-making in NereducherlaMandal are largely male-dominated, though women are participating to a smaller extent. Gender-focused training may be needed to encourage broader involvement of women in farm tourism and AI adoption.
- **Educational Qualification:** 35% have secondary education and 28% are graduates. Primary education and no formal education account for 37% combined, while only 1% have postgraduate education.
- **Farming Experience**: Most farmers have sufficient literacy to understand farm tourism operations and AI technologies, though a significant portion with low education may need additional guidance or training for effective technology adoption.
- **Farm Size:** 40% have 11–20 years of experience and 27% have more than 20 years. Farmers with less than 10 years' experience comprise 33%. The majority of respondents are experienced farmers, indicating a strong understanding of traditional agricultural practices, which provides a solid foundation for integrating AI and tourism-based activities. Less experienced farmers may require mentorship or hands-on training.
- **Involvement in Farm Tourism** 64% of farmers are actively participating in farm tourism, whereas 36% are not. A majority of respondents are already engaged in farm tourism activities, reflecting growing local awareness and interest. The remaining non-participants represent potential for expansion and outreach to promote agritourism.
- **Use of AI in Farming** 38% of respondents have adopted AI-based tools in farming, while 62% have not.While AI adoption is still moderate, there is significant potential for increasing awareness and training.

Inferential Statistics:

(H_1): Adoption of AI technologies in farm operations is positively associated with increased farm productivity and improved tourist experiences.

Tab: Cross-tabulation of AI Adoption and Farm Productivity/Tourism Experience

AI Adoption \ Tourism Experience	Low	Medium	High	Total
Low (1–2.5)	4	8	2	14
Medium (2.6–3.5)	3	18	12	33
High (3.6–5)	1	11	53	65
Total	8	37	67	112

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Source: Primary Data

Interpretation

Trend Analysis:

- Among farmers with High AI adoption, 53 out of 65 (81%) report High farm productivity & tourism experience, showing a strong positive association.
- Medium AI adoption farmers have mixed outcomes, with 12/33 (36%) reporting high productivity/tourism.
- Low AI adoption farmers mostly report low to medium productivity/tourism outcomes.

Association Observation:

- As AI adoption increases from Low → High, the proportion of farmers experiencing high farm productivity and better tourism outcomes also increases.
- Indicates positive trend, supporting H_1.

Hypothesis-2

H_0: There is no significant relationship between farmers' level of AI awareness/perception and their adoption of AI in farm tourism.

Tab: Cross-tabulation of AI Awareness/Perception and AI Adoption in Farm Tourism

Level of AI Awareness	High Adoption	Low/Medium Adoption	Total
Low Awareness	0	11	14
Moderate Awareness	8	18	33
High Awareness	65	10	65
Total	73	39	112

Source: *Primary Data*

Interpretation:

- Among farmers with **low AI awareness**, none show high adoption, while 100% exhibit low/medium adoption, suggesting that lack of knowledge limits AI integration in farm tourism.
- Farmers with **moderate awareness** show 31% high adoption and 69% low/medium adoption, indicating partial engagement with AI practices.
- **High-awareness farmers** have 87% high adoption and 13% low/medium adoption, showing a strong positive relationship between awareness and adoption.

Tab: Correlation of AI Awareness and AI Adoption

Variables	AI Awareness/Perception	AI Adoption in Farm Tourism
AI Awareness/Perception	1	0.68**
AI Adoption in Farm Tourism	0.68**	1
Sig. (2-tailed)	—	0.000
N	112	112

Source: *Primary Data*

Correlation is significant at the 0.01 level (2-tailed)

Interpretation:

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- The Pearson correlation coefficient (r = 0.68) indicates a **strong positive relationship** between AI awareness and AI adoption.
- Farmers with higher knowledge and positive perceptions of AI are more likely to adopt AI in their farm tourism practices.

Since **p = 0.000 < 0.01**, the null hypothesis (H_0) is rejected. Hence,Awareness significantly influences adoption of AI in farm tourism. Training, workshops, and awareness campaigns can therefore enhance adoption rates, improve farm efficiency, and enrich tourist experiences.

Hypothesis-3

Tab: Cross-tabulation of AI Awareness and AI Adoption

AI Awareness/Perception \ AI Adoption	Low	Medium	High	Row Total
Low (1–2.5)	7	4	0	11
Medium (2.6–3.5)	3	15	8	26
High (3.6–5)	0	10	65	75
Column Total	10	29	73	112

Source: *Primary Data*

Interpretation: Farmers with high AI-enabled farm tourism practices mostly report high socio-economic **impact** (54/65, 83%). Medium adoption shows mixed outcomes, and low adoption mostly aligns with low-to-medium socio-economic impact.

Trend indicates a positive association between AI-enabled farm tourism and income, employment, and sustainable practices

Dependent Variable (Y): Socio-Economic Impact
Independent Variable (X): AI-Enabled Farm Tourism

Tab: Linear Regression Analysis

Model Summary	Value
R	0.63
R^2	0.396
Adjusted R^2	0.389
Std. Error of Estimate	0.52

Source: *Primary Data*

Interpretation:

- $R^2 = 0.396 \rightarrow$ AI-enabled farm tourism explains **39.6% of the variance** in socio-economic impact.
- Adjusted R^2 confirms the model accounts for most of the variance with minimal bias.

Tab: ANOVA

ANOVA	F	Sig.

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Regression	72.5	0.000

Source: *Primary Data*

Interpretation:

- F = 72.5, p < 0.01 → Regression model is **statistically significant**, confirming that AI-enabled farm tourism significantly predicts socio-economic outcomes.

Tab: Coefficients

Coefficients	B	Std. Error	Beta	t	Sig.
Constant	1.28	0.34	—	3.76	0.000
AI-Enabled Farm Tourism	0.65	0.08	0.63	8.51	0.000

Interpretation:

- Beta = 0.63, t = 8.51, p < 0.01 → AI-enabled farm tourism has a strong, positive, and significant impact on farmers' income, employment, and sustainable practices.Constant indicates baseline socio-economic impact when AI-enabled tourism adoption is zero.

Conclusions

Demographic Divide

1. Majority of respondents (42%) are aged 36–45 years, showing that the farming population is mature and experienced, capable of adopting AI and participating in farm tourism.
2. 78% male and 22% female participation indicates male dominance in farm management, though women's involvement shows potential for greater engagement with training and support.
3. Most farmers have secondary or graduate education (63%), indicating sufficient literacy to understand AI technologies and tourism operations.
4. About 67% of farmers have more than 10 years of experience, reflecting familiarity with agricultural practices and readiness to adopt innovations.
5. Small-to-medium farms (1–3 acres, 46%) dominate, suitable for piloting farm tourism initiatives, while larger farms can offer more diversified tourism activities.
6. 64% of farmers are actively engaged in tourism activities, showing awareness and interest in farm-based tourism.

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7. Only 38% of farmers currently use AI in their farms, indicating room for expansion through awareness and technical support.

Inferential Statistics

1. Farmers who adopt AI technologies experience improved farm efficiency and provide better tourism experiences.
2. Higher awareness and positive perception of AI significantly influence farmers' adoption of AI in farm tourism. Awareness programs, workshops, and exposure visits can increase adoption rates.
3. AI-enabled farm tourism significantly improves farmers' income, employment opportunities, and sustainable agricultural practices, supporting rural development and livelihood diversification.

Scope for Future Study

Similar studies can be conducted in other mandals or districts of Telangana to compare regional variations in AI adoption and farm tourism outcomes.

Future research

- Can focus on strategies to increase youth and women engagement in AI-enabled farm tourism.
- Track long-term impacts of AI adoption on productivity, income, and tourist satisfaction across multiple cropping seasons.
- Technology Assessment: Investigate emerging AI tools, digital marketing, and virtual farm tourism experiences to further enhance farm tourism adoption.
- Policy and Sustainability: Examine government policies, economic incentives, and sustainability measures that can facilitate AI adoption and strengthen rural livelihoods.
- Farmers in NereducherlaMandal are moderately experienced, educated, and interested in farm tourism.
- AI adoption and awareness are key drivers of productivity, tourism experience, and socio-economic benefits.
- There is strong potential for policy support, training programs, and technological interventions to further improve farm tourism adoption and rural development

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