Optimizing Farmland Landscapes for Agri-Tourism Integration in Lingnan Rural Revitalization: A Case Study of Naliu Village, China

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Abstract. As rural tourism gains momentum amid rising living standards and growing health awareness, the integration of agriculture and tourism has become a key strategy for promoting rural revitalization. Farmland landscapes, traditionally focused on agricultural production, are increasingly evolving into multifunctional systems that encompass ecological, cultural, recreational, and educational roles. However, current farmland landscapes often suffer from limited functionality, weak cultural expression, and poor visitor experience, which restrict their tourism appeal and multi-dimensional value. This study adopts a qualitative research approach to explore the optimization of farmland landscapes from a visitor-centered perspective. Using Naliu Village in Zhanjiang, Guangdong Province as a case study, the research integrates Maslow's hierarchy of needs and landscape preference theory. Methods include photo-elicited interviews and thematic analysis, forming a four-stage framework: preference expression, needs categorization, function translation, and strategic recommendation. Expert interviews supplement the study with insights on functional planning, cultural representation, and implementation feasibility. Findings reveal that visitors prefer landscape features that are aesthetic, interactive, and culturally expressive, corresponding to different levels of psychological needs. Cultural identity is a key motivator for engagement and loyalty, while basic infrastructure influences initial accessibility. The study proposes a "multi-level preference–needs response" framework to guide the design of layered and participatory farmland spaces. It highlights four value dimensions—basic provision, cultural identity, participatory interaction, and emotional attachment—as crucial for enhancing visitor experience and realizing synergies between ecological conservation, tourism development, and cultural continuity. The study offers theoretical contributions to landscape perception research and practical guidance for designers, tourism operators, and rural planners involved in farmland landscape enhancement.

1. Introduction

With the accelerated process of urbanization, rural regions—particularly those located at urban fringes—are increasingly exposed to ecological pressures and spatial competition[1]. These transitional zones once functioned as ecological buffers and carriers of local identity, yet rapid urban expansion has contributed to significant declines in ecological diversity, agricultural vitality, and landscape integrity[2-3] as shown in Figure 1. Farmland landscapes, as fundamental components of rural territorial systems, are facing fragmentation, productivity decline, and reduced aesthetic appeal, resulting in weakened ecological resilience and insufficient attractiveness[4]. Additionally, standardized farming patterns driven by industrialized agriculture further intensify the homogenization of rural environments, restricting their adaptability to emerging multifunctional demands, including leisure and tourism [5].

Contemporary rural tourism has shifted from traditional sightseeing to immersive and experiential engagement, driven by rising living standards and evolving aesthetic preferences among urban residents [6]. While farmland landscapes are increasingly expected to provide ecological experiences, cultural recognition, and recreational participation alongside agricultural production, most existing agri-tourism models rely on standardized designs with limited cultural depth, leading to tourist fatigue and diminished competitiveness [7]. Current landscapes often lack integrated planning and user-centered design, resulting in underutilized ecological, productive, and recreational functions [8]. Although China's Rural Revitalization Strategy positions farmland as key strategic spaces for ecological security and socio-economic resilience [4], existing research remains predominantly ecological, paying insufficient attention to tourists' subjective perceptions and experiential needs - critical determinants of agri-tourism success.

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Fig. 1. Photos of Ruined farmland

This study addresses these gaps by examining farmland landscape optimization in Naliu Village, Zhanjiang, a representative agricultural settlement in Guangdong Province rich in Leizhou cultural heritage yet facing challenges in cultural expression and visitor experience quality [9]. Grounded in Maslow's hierarchy of needs and landscape preference theory, the research employs photo-elicitation interviews (PEI) and expert interviews to systematically capture multi-layered landscape perceptions. Through thematic analysis, it identifies key design elements enhancing ecological performance, cultural identity, and emotional attachment. The study ultimately constructs a "multi-level needs-preference response model" to inform optimization strategies that support both agricultural productivity and rural tourism, offering scalable insights for ecological conservation, industrial integration, and cultural continuity in rural revitalization contexts.

2. Literature review

2.1 Research status of farmland landscapes

Farmland landscapes constitute fundamental components of rural territorial systems, serving as primary carriers of agricultural production, ecological processes, and rural identity [10]. Under China's Rural Revitalization Strategy, these landscapes are increasingly recognized as multifunctional assets that strengthen ecosystem services, tourism value, and cultural continuity. The transition from production-oriented to multifunctional agriculture highlights the importance of landscape optimization for economic restructuring and spatial regeneration[11], particularly in southern coastal regions like Zhanjiang where distinct tropical crop systems offer significant tourism potential.

The multifunctionality concept frames farmland as simultaneously providing production, ecological, cultural, and recreational functions (OECD, 2020). While production remains foundational, societal demand has shifted toward ecological health and experiential consumption [12]. Ecologically, farmland supports biodiversity and microclimate regulation [13]; culturally, it sustains planting traditions and agricultural festivals; recreationally, it offers visual amenity and restorative benefits[11].

Landscape aesthetics significantly influence tourist destination choices, with preferences depending on visual composition, seasonal variation, and perceived naturalness[14]. Structured field patterns, distinctive crop textures, and water networks enhance scenic attractiveness[15]. As visitor motivations evolve toward participatory experiences[16], farmland aesthetics must align with experiential needs through interpretive design and agricultural branding[17].

Agri-tourism integration requires spatial reconfiguration to support accessibility and visitor flow management [18]. Optimized landscapes can form theme-based agricultural zones that combine production with interactive spaces, increasing value transformation efficiency [19]. Globally, agricultural parks and demonstration farms enhance productivity and community engagement when integrated with tourism [20].Existing research exhibits several limitations. Most studies focus on northern grain belts or peri-urban agriculture [14] overlooking South China's tropical agricultural systems[21]. Previous work emphasizes either ecological function or tourism planning separately, with limited integration of visual preferences into spatial enhancement[15]. Current optimization frameworks often remain conceptual, lacking practical guidelines for specific rural communities[22].

Three significant gaps persist. First, while farmland serves as both productive space and cultural carrier [16], its influence on visitors' psychological perceptions and behavioral intentions remains underexplored. Second, empirical studies incorporating both expert and tourist perspectives are scarce, limiting practical applicability. Third, current literature rarely addresses psychological mechanisms underpinning landscape preference, focusing instead on visual aesthetics rather than deeper needs for safety, belonging, or self-fulfillment.

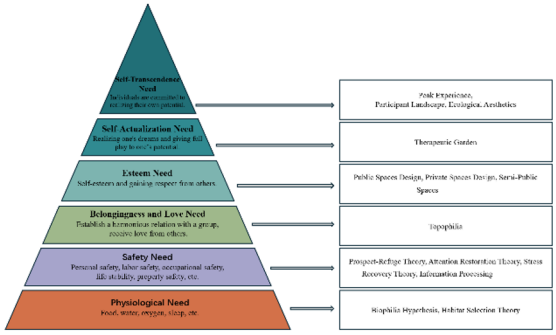

Fig. 2. Maslow believed that people have six different levels of needs latent in them, and the urgency of the various needs expressed at different times is different(Yan et al., 2023).

Although Yan et al. (2023) proposed integrating Maslow's hierarchy with landscape preference, their model lacks a mature analytical framework in Figure 2[23]. Furthermore, research on behavioral effects of landscape optimization remains limited, with insufficient empirical evidence regarding environmental awareness and pro-environmental behaviors. A comprehensive "preference-need-behavior" analytical framework could reveal cognitive differences among visitor groups, informing optimization strategies that balance ecological and experiential values for sustainable farmland landscape design.Thus, adopting interdisciplinary

approaches integrating ecology, psychology, and tourism behavior is in need.

2.2 Comparative cases

To inform farmland landscape optimization and agri-tourism integration in Naliu Village, four representative cases were reviewed—Tashiro Village in Japan, Rosendal Manor in Sweden, the Grain Production Functional Zone in Wenling, and Pineapple Sea in Xuwen, China. These cases demonstrate diverse strategies for integrating agricultural production, ecological protection, and tourism development. Tashiro Village, located in Aomori Prefecture, Japan, transformed its traditional rice fields into an annual "Rice Field Art Festival" beginning in 1993. By planting multi-colored rice varieties, villagers create large-scale artworks depicting cultural motifs such as the Mona Lisa and The Great Wave off Kanagawa. This creative use of farmland has revitalized the local economy and strengthened community identity, illustrating how aesthetic innovation and agricultural creativity can enhance tourism appeal and rural vitality[24]. However, diversification beyond rice art is essential for sustaining long-term attraction.

Rosendal Manor in Sweden exemplifies the integration of ecological agriculture with leisure functions (Figure 3a). Operating as a biodynamic farm since the 19th century, it promotes regenerative agriculture without chemical inputs and offers experiential activities such as organic food tasting and ecological workshops. Its success demonstrates that sustainability-oriented agriculture can simultaneously provide educational, ecological, and recreational benefits, enhancing public environmental awareness and tourism value [16]. The Grain Production Functional Zone in Wenling, Zhejiang, applies ecological engineering approaches to mitigate non-point source pollution and enhance farmland biodiversity(Figure 3b). By implementing nitrogen and phosphorus interception ditches, ecological floating beds, and nectar plant–based pest control, the project reduced pesticide use by 20–30% and increased crop yields by more than 10%. This case highlights how technological innovation and landscape design can jointly improve production efficiency and ecological aesthetics [19].The Pineapple Sea in Xuwen, Guangdong, integrates large-scale pineapple cultivation (over 110,000 acres) with cultural tourism development, including festivals, fruit-picking, photography, and art events (Figure 3c). Supported by infrastructure investments and environmental planning, it has become a model of agricultural–tourism synergy, enhancing the region's economic resilience and cultural identity.

As above cases revealed that three key strategies for farmland landscape optimization: (1) Cultural and creative transformation to enhance tourism attraction (Tashiro Village); (2) Ecological and sustainable management to balance productivity and environmental protection (Rosendal Manor, Wenling); and (3) Integrated cultural tourism planning to strengthen local identity and stimulate economic growth (Pineapple Sea). Together, they demonstrate that multifunctional farmland landscapes can effectively promote rural revitalization through agri-tourism integration, offering valuable insights for the optimization and sustainable development of Naliu Village's agricultural landscape.

Fig. 3. a: Photos of J Rosendal Mano (left top); **b**:Grain Production Functional Zone(right top); **c**:Pineapple Sea(bottom)

3. Methodology

3.1 Research design

This study adopts a Qualitative Descriptive Design, aiming to explore, in participants' own words, the preferences, perceptual needs, and optimization strategies for farmland landscapes from the perspectives of both tourists and experts within the context of agri-tourism integration. This approach seeks to "describe the world using participants' own language" [25-26], emphasizing authenticity, contextual detail, and the direct transformation of lived experience into design insight. It is particularly suited to exploring complex and subjective phenomena such as landscape perception, emotional response, and participatory behavior.

Compared with phenomenology or grounded theory, this research adopts a pragmatic orientation—translating participants' narratives into spatial and strategic recommendations [27]. The study focuses on identify the design elements and functional features of existing farmland landscapes and optimization strategies aligning with the goals of agri-tourism integration.

At the theoretical level, the research framework integrates Landscape Preference Theory (Kaplan & Kaplan, 1989) and a compressed version of Maslow's Hierarchy of Needs, forming a three-tier P–N–B model (Perception – Need – Behavior) [28-29]. Landscape Preference Theory–featuring the dimensions of coherence, complexity, mystery, and legibility—explains aesthetic selection and perceptual mechanisms, while Maslow's framework captures psychological motivations from basic to growth-level needs.

Participants include (1) urban tourists with prior agri-tourism experience and (2) experts in landscape, agriculture, and rural development. Data are collected via Photo-Elicitation-Based Semi-Structured Interviews (PEI) with tourists and semi-structured expert interviews. In PEI, participants select 1–3 representative farmland landscape images and describe their visual perception, emotional experience, and satisfaction of basic, social, or growth

needs. This method elicits authentic, emotionally charged reflections and strengthens the connection between perception and design relevance.

Data analysis employs Braun and Clarke's (2006) six-phase Thematic Analysis, supported by MAXQDA 2022, encompassing data familiarization, coding, theme identification, theme review, theme definition, and reporting. Thematic analysis is selected for its methodological flexibility and compatibility with qualitative descriptive research, enabling structured interpretation of unstructured data while preserving contextual richness.

The three-tier analytical framework includes: Perceptual Layer which combined with visual preferences, spatial characteristics, and aesthetic elements; Emotional Layer which is the affective attachment, restorative experience, and sense of harmony; and the Needs Layer which is the sense of security, belonging, and personal growth.

This framework reveals the internal mechanisms linking perceptual features to psychological needs and behavioral intentions, forming an empirical foundation for landscape optimization. Thematic analysis offers three advantages as structure extraction, context preservation, and strategies[16,17,30]. Structured extraction with which transforming narrative data into thematic nodes that identify preference patterns and cognitive tendencies; Thematic analysis gives context preservation which maintaining situational and emotional nuance critical for interpreting subjective experiences [16]. Thematic analysis provided strategic relevance, which enabling the derivation of actionable design interventions—such as spatial optimization, participation enhancement, and experience diversification [17,21,30].

Thus, by integrating qualitative descriptive design with thematic analysis, the study ensures that findings are both theoretically grounded and practically applicable, preserving participants' authentic voices while generating actionable recommendations for the optimization of multifunctional farmland landscapes in agri-tourism contexts.

3.2 Research design

This research take qualitative research methodology, as qualitative descriptive design effectively bridges theory, empirical experience, and design strategy, aligning with the principles of human-centered and evidence-based rural landscape research[31]. Through this approach, the study not only captures the complex interplay between perception, need, and behavior but also provides a solid methodological foundation for developing multifunctional, participatory, and emotionally resonant farmland landscapes that support rural revitalization through agri-tourism integration.[32]. First, the study investigates subjective preferences and perceptual needs—phenomena that are context-sensitive and resistant to quantification. Qualitative methods emphasize meaning-making and experiential construction [12]. Emerald Publishing Limited.,can enables the exploration of the "preference–need–behavior" pathway, uncovering the motivational and perceptual mechanisms shaping tourists' and experts' engagement with farmland landscapes, while quantitative models are limited in capturing emotional and motivational subtleties, whereas). Photo-Elicitation Interviews (PEI) also has advantages in enhancing the depth and authenticity of data collection. It suits this research, by starting from personal visual stimuli, participants articulate emotions and behavioral intentions connected to landscape experiences. This approach facilitates memory recall and expressive richness,yielding first-hand, design-relevant data suitable for thematic analysis and spatial strategy formulation[33]. Additionally, the theoretical integration of Landscape Preference Theory and Maslow's Hierarchy of Needs establishes an explanatory interpretive model, rather than a hypothesis-testing framework. Such theory demands narrative depth and experiential data to reveal how perceptual aesthetics translate into psychological satisfaction and behavioral expression. Hence, qualitative description provides the most appropriate methodological alignment. Moreover, existing research on agri-tourism-based farmland landscape optimization often lacks empirical grounding in user experience. This study directly addresses that gap by emphasizing experiential data collection and translation into strategic application, bridging the disconnect between perception-level understanding and design-level intervention. Fourth, the feasibility and scalability of qualitative methods offer distinct advantages for case-based, interdisciplinary studies. With Naliu Village, Lingnan, as the research site and a moderately sized sample, qualitative inquiry enables an intensive exploration of contextual phenomena without being constrained by rigid quantitative indicators. It allows for depth over breadth, producing explanatory insights relevant to both theory and practice.

3.3 Data collection

To address the research objectives, this study adopted a triangulation strategy integrating semi-structured interviews, photo-elicitation interviews (PEI), literature analysis, and field observation, ensuring a multidimensional understanding of tourists' and experts' landscape perceptions and psychological needs. The data collection comprised two phases: (1) pre-screening and recruitment through online and on-site questionnaires to gather demographic data and preliminary landscape preferences; and (2) photo-elicitation semi-structured interviews in which participants provided 1-3 photographs representing memorable farmland experiences. These photographs served as visual stimuli to evoke experiential recall and emotional reflection, thereby enhancing data depth and authenticity [34-35].

The PEI method, widely used in landscape and sociocultural studies enables participants to articulate complex cognitive and affective dimensions of environmental experience [25-26]. Participant-generated images were adopted as the core material to improve ecological validity and engagement. Each photo was required to depict a rural agricultural environment within the past year and convey positive or negative impressions.

When necessary, up to 20% of supplementary local landscape photos were provided by the researcher. The interviews followed a P–D–B structure to elicit perceptions, needs, and behavioral intentions, with sessions lasting 30–50 minutes. All interviews were recorded, transcribed verbatim, and coded using MAXQDA.

Representative applications of PEI in related research demonstrate its strength in revealing the interrelations between personal experience, cultural context, and environmental identity[36-37]. Nonetheless, challenges such as interpretive polysemy and unstructured data volume were addressed by employing Kaplan and Kaplan's (1989) preference matrix and thematic coding through NVivo/MAXQDA. Ethical considerations—including informed consent, anonymity, and privacy protection—were strictly observed.

Expert semi-structured interviews complemented the PEI data, offering interdisciplinary perspectives to triangulate tourists' preferences and identify systemic gaps [18,38]. Experts (n=5) from landscape design, agritourism, and rural planning were purposively selected, while tourists (n=15) were recruited via maximum variation sampling to ensure demographic and motivational diversity [20]. The sample size followed the principle of data saturation, typically achieved with 9–17 interviews in qualitative research [39]. Snowball and convenience sampling served as alternative recruitment methods when necessary.

All interviews were conducted in Mandarin to preserve linguistic authenticity. Data were analyzed in the original language to maintain cultural nuances before translation for publication. Each interview lasted 40–60 minutes, guided by open-ended questions related to farmland landscape optimization, aesthetic preference, and functional integration [40-41]. Ethical safeguards included signed informed consent, anonymization, and verification of transcripts within 24 hours.

The interview guide was theoretically grounded in Landscape Preference Theory (Kaplan & Kaplan, 1989), Restorative Environment Theory (Ulrich, 1983), and a condensed Maslow's hierarchy of needs. Questions were structured across three analytical layers—perceptual (visual preference), emotional (restorative experience), and motivational (behavioral intentions)—allowing systematic exploration of tourists' psychological and aesthetic responses. This mixed-method framework effectively captured the interplay between perception, emotion, and need, providing empirical foundations for optimizing farmland landscape design and agritourism development.

4. Results and findings

This section presents the empirical results of the qualitative investigation into the perceptual, emotional, and behavioral responses of visitors and experts toward farmland landscapes in the context of agritourism. The analysis follows the Preference–Demand–Behavior (P–D–B) model established in the theoretical framework . The interviews were conducted between June 2024 and July 2025 in Naliu Village,adopting photo-elicitation and semi-structured interviews. Data were analyzed using Braun and Clarke's (2006) six-phase Thematic Analysis with MAXQDA 2022.A total of 20 participants were interviewed, comprising 15 tourists and 5 experts. The 15 tourists (8 females, 7 males; aged 25–58 years) represented diverse occupational backgrounds—teachers, engineers, civil servants, designers, and digital media freelancers . Their participation in agritourism activities ranged from casual weekend leisure to organized educational trips.

Interview data indicated that motivation diversity significantly shaped landscape perception. Four motivation types were identified as:Recreation-seeking (relaxation and escape from urban stress, 6 participants); Educational/parent–child (learning and nature exposure, 4 participants); Digital content creation (aesthetic image-making, 3 participants); Wellness and nostalgia (emotional reconnection to childhood rural memories, 2 participants).The photo-elicitation process revealed that respondents commonly selected images of rice fields, terraces, ponds, rural paths, and ancestral halls. Word frequency and visual clustering in MAXQDA showed "peace," "natural," "open," "authentic," and "childhood" as the most recurrent descriptors (Figure 4).

Fig.4: Visitors' snapshots (T01, T02, T12, T15, T09)

Notably, age and occupation influenced perceptual focus. Younger respondents (25–35 years) and digital creators valued visual composition and shareability, often referring to "good lighting," "color contrast," or "Instagrammable scenes." In contrast, family groups and older participants emphasized safety, accessibility, and educational potential, highlighting functional rather than purely aesthetic qualities.The five experts (3 males, 2 females; aged 38–50 years) represented diverse fields: landscape planning (2), agritourism operations (1), agroecology (1), and rural policy and cultural heritage (1). Most held over ten years of professional experience (Table 1).Experts approached farmland primarily as a multifunctional system integrating ecological, productive, and cultural dimensions. Their narratives focused on ecosystem resilience, community co-benefits, and long-term management, contrasting visitors' emphasis on short-term aesthetic and experiential qualities. This difference underpins the experiential–professional tension central to the research problem.Following Braun and Clarke's (2006) six-phase method, 312 initial codes were generated, clustered into nine subthemes and

subsequently synthesized into three overarching themes corresponding to the P–D–B model which are: Perceptual Preferences,Psychological Needs, and Behavioral Intentions and Participation. Each theme is presented below with representative quotes and supporting analysis.

4.1 Theme 1: Perceptual preferences — The dual aesthetic of farmland

Across the dataset, participants articulated a dual aesthetic orientation that oscillated between naturalness and order. Respondents consistently valued unstructured, spontaneous vegetation ("wildflowers," "reeds," "muddy paths") yet also praised neatly patterned terraces and structured irrigation lines. This paradox indicates a desire for 'controlled naturalness', where visual coherence coexists with ecological authenticity. As one visitor expressed, "Fields that aren't overly organized feel comfortable—like my grandmother's countryside." (T03). Another countered:"The lines here are perfect for photos. I like it when nature looks designed." (T08)This contradiction illustrates the coexistence of restorative and performative aesthetics, reflecting Shen et al. (2024) [1], Huang et al.,(2024),and Krajewski et al.,(2025) [40-41], who note that restorative experiences depend on both sensory comfort and legibility. Experts interpreted this differently. One expert noted, "Unmaintained wildness can undermine ecological function; we need structured biodiversity." (E01) The contrast suggests that visitors equate visual wildness with authenticity, while experts emphasize ecological order as sustainability, marking the first major divergence (Table1).

Table 1. Protection and reinforcement

Sub-theme	Visitor Expressions	Illustrative Quotes	Design Implications
Naturalness	Wild vegetation, minimal intervention	"Fields that aren't overly 'organized' …" (T03)	Preserve wild edges, avoid over-regularization
Order and Photogenic Views	Neat rows, defined paths, symmetry	"This shot is perfect for photography …" (T08)	Maintain layered vistas, photogenic layouts
Interactivity and Playfulness	Participation, sensory engagement	"Info boards or animals would make it better" (T06)	Add educational signage, interactive zones

4.2 Theme 2: Psychological needs — from comfort to growth

Analysis of emotional expressions and narrative content revealed a three-layer structure of psychological needs, adapted from Maslow's hierarchy: basic comfort, social belonging, and personal growth. Comfort and Safety level:Participants frequently mentioned shade, resting facilities, pest control, and trail stability as essential for enjoyment. "We left early because of mosquitoes and mud," (T12) exemplifies the dominance of environmental comfort in shaping satisfaction (Table 2). Social Interaction: Families and groups sought interactional value—shared experiences, local hospitality, and opportunities for informal play. "We want kids to get dirty and play—it's about human connection." (T01). Cognitive Growth: Participants associated farmland visits with learning and self-reflection. "Explaining planting to my child made me realize how disconnected we are from food." (T05) Experts extended this hierarchy by associating comfort with infrastructure design, belonging with community participation, and growth with environmental literacy. These findings resonate with Heilandet, et al.,(2025) Anwar,et al.,(2020) and Yan,et al., (2023) confirming farmland's evolving role as a cognitive and social landscape rather than a purely visual one [19-21].

Table 2. Visitor psychological needs and design implications

Level	Visitor Needs	Illustrative Quotes	Design Implications
Comfort and Safety	Shade, safety, hygiene	"Mosquitoes… embankments slippery" (T12)	Shaded nodes, anti-slip paths, pest management
Social Interaction	Family/group bonding	"We want kids to play in the mud" (T01)	Wide paths, group seating, family play areas
Cognitive Growth	Education, cultural learning	"Sparks children's curiosity" (T05)	Educational signage, guided tours, heritage displays

4.3 Theme 3: Behavioral intentions — engagement, revisit, and sharing

Visitor narratives converged around three types of behavioral intention (Table 3).Revisit Intention level: 60% of participants indicated conditional willingness to return, contingent on event novelty or seasonal change. "I'd come again if there are new crops or festivals." (T13).Word-of-Mouth and Sharing : Younger visitors expressed high motivation for visual documentation—"This spot is perfect for short videos." (T02)—demonstrating the rising influence of social media aesthetics on agritourism behavior. Community Participation: A smaller group (4 participants) articulated interest in participating in farming or purchasing local products—"I'd buy rice here if they had their own brand." (T09).Listed below in Table 3.

Table3. Visitor behavioral intentions and design implications

Level	Visitor Needs	Illustrative Quotes	Design Implications
Revisit	Novelty, maintenance, crowd management	"Might not come again unless new activities" (T13)	Seasonal festivals, activity diversification
Word-of-Mouth and Sharing	Photogenic quality, shareability	"Perfect for short videos" (T02)	Scenic points, content-friendly design

Community Participation	Volunteerism, product purchase	"I'd also buy more local products" (T09)	Farm-to-market integration, visitor farming programs

4.4 Contradictions and convergences

Experts similarly emphasized participation as key to sustainability in Table 3: "Visitors should not just watch but contribute—help harvest, learn, or co-create." (E02), Listed in Table 4. This convergence indicates an opportunity for interactive programs that transform passive sightseeing into experiential co-production, echoing Wang et al. (2024) [21].

Table 4. Expert Insights on Visitor Experience and Social Implications

Sub-theme	Expert Perspective	Illustrative Quotes	Design Implications
Community Relations	Identity, farmer support	"Landscapes… carriers of community relations" (E04)	Incorporate heritage markers, co-management
Local Economy	Participation, volunteerism	"Visitor participation impacts village economy" (E05)	Visitor purchase schemes, local markets
Guided Behavior	Balance of freedom/protection	—	Activity zoning, interpretive guidance
			inclusive, and sustainable
Interactivity	Play, picking, animals, signage	Festivals, guided farming, structured participation	Develop interactive zones balancing fun and management
Cultural Identity	Nostalgia, family memory, education	Heritage markers, rituals, local identity	Landscapes as cultural carriers for both locals and visitors

Both groups recognized farmland landscapes as multifunctional cultural-ecological systems, agreeing on the importance of safety, accessibility, and aesthetic appeal. Both valued participation and education, albeit for different ends—visitors sought experience, while experts pursued sustainability. However, three structural contradictions emerged as Wildness vs. Order: Visitors valued sensory wildness; experts emphasized ecological management. Immediate Comfort vs. Long-term Maintenance: Visitors prioritized short-term satisfaction; experts preferred durability and resource efficiency. Emotional vs. Cognitive Engagement: Visitors framed learning as spontaneous experience; experts emphasized structured environmental education. These reflect differing temporal orientations—visitors focus on momentary immersion, while experts pursue systemic continuity. This aligns with Plieninger et al.,(2020), who describe the enduring tension between experiential aesthetics and ecological planning rationality in landscape management [18]. It synthesizes the convergences and divergences between visitors and experts across perception, needs, and behavior dimension in Table 5.

Table 5. Convergences between visitors and experts

Theme	Visitor Perspective	Expert Perspective	Convergent Implication
Safety and Comfort	Shade, pest control, accessible paths	Durable circulation, maintenance feasibility	Design circulation that is safe,

4.5 Synthesis and design implications

The findings suggest that farmland landscape design should integrate aesthetic authenticity, psychological satisfaction, and ecological sustainability through a multi-layered participatory approach. At Ecological Authenticity level, it is better to preserve visible traces of farming and spontaneous vegetation to sustain perceived "authenticity" while maintaining ecological resilience [33,42]. At Comfort and Safety Design level,it 's better to implement low-maintenance paths, shading, and pest management to ensure comfort without visual intrusion. At Social and Educational Integration level, develop modular programs—harvesting, planting, local festivals—that blend leisure, learning, and community participation. Digital Mediation: Incorporate visual storytelling, QR-guided tours, and AR-enhanced interpretation to satisfy social media-oriented visitor behavior. By aligning experiential motivations with professional sustainability goals, farmland can evolve into a dynamic socio-ecological system, achieving balanced outcomes across tourism, production, and cultural continuity.

5. Discussion

A comprehensive analysis of visitor and expert interview data reveals a multi-dimensional interaction between farmland landscape experience and planning optimization. From the visitor perspective, landscape perception, psychological needs, and behavioral intentions constitute the core framework through which value is assigned to farmland landscapes. Experts, however, interpret these elements through the lenses of ecology, planning, and social sustainability, providing institutional and practical rationales that translate subjective perceptions into implementable design and management strategies. When integrated, these perspectives illuminate both the driving mechanisms of visitor experience and the scientific safeguards necessary to ensure that these experiences can be delivered sustainably.

5.1 Landscape preferences

Visitors demonstrated strong preferences for naturalness, ecological quality, spatial order, and interactivity, while experts emphasized ecological function, cultural heritage, and sustainability. Notably, these orientations were more

aligned than divergent. For example, visitors frequently expressed appreciation for unmodified field paths, wild vegetation, and interlaced water systems. These preferences resonate closely with expert recommendations for low-intervention ecological management and optimization of farmland hydrological connectivity, which not only preserve biodiversity but also enhance scenic variety.

Similarly, visitors' appreciation of visual order and photogenic qualities corresponds to expert strategies for spatial node design and layered planning. Photogenic fields, terraces, and paths serve dual purposes: they meet visitors' desire for picturesque scenery and provide visual coherence that supports ecological and circulation planning. This reflects the idea, supported by Wang et al. (2024) [21], that visual aesthetics can act as a bridge between recreational satisfaction and ecological design.

Finally, the desire for interactivity and playfulness—picking crops, touching water, or learning through signage—was echoed by experts, who emphasized structured agri-tourism experiences such as designated picking zones, water-play areas, and interpretive installations. Here, however, partial conflicts emerge: while visitors seek freedom of movement, experts must limit ecological disturbance through zoning and visitor management.

Landscape preferences thus reveal a broad zone of complementarity. Visitors provide cues about what makes landscapes emotionally and visually compelling, while experts translate these into design parameters that balance beauty with function. The integration suggests that optimization should focus on wild-structured aesthetics, photogenic nodes, and carefully managed interactivity that preserve ecological integrity while enhancing experiential quality.

5.2 Psychological needs and interpretation

Visitors expressed multi-layered psychological needs, spanning physiological safety, social-emotional connection, and cognitive growth. Experts systematically addressed these needs through design and operational strategies. For instance, physiological needs—shade, safe paths, insect control—correspond to expert recommendations for leveled walkways, rest areas, and shaded facilities. Such infrastructure not only enhances visitor safety but also supports universal accessibility, a theme increasingly recognized in rural tourism design (Li et al., 2023).At the social and emotional level, visitors emphasized family walks, children's play, and shared experiences. Experts recommended community engagement activities, parent–child interactive zones, and seasonal festivals to meet these needs. This alignment demonstrates that social connection is both a visitor expectation and a strategic design driver for experts, who view it as essential for building attachment to place. For cognitive growth, visitors sought agricultural knowledge and cultural insights. Experts responded with strategies such as interpretive boards, guided tours, and heritage-based design, creating educational opportunities that expand visitor understanding while reinforcing cultural continuity. This complementarity echoes Maslow's higher-level needs for learning and self-actualization, confirming that farmland landscapes can serve as sites of personal and cultural enrichment. Visitor needs thus provide a hierarchical template for design, while expert strategies ensure that these needs are addressed in sustainable, feasible ways. Together, they demonstrate that farmland optimization must be multifunctional, meeting not only aesthetic expectations but also psychological, social, and cognitive demands.

5.2 Behavioral rural community intentions and interpretation

Visitor behavioral intentions including revisit, word-of-mouth sharing, and community engagement are highly conditional, depending on novelty, interactivity, and maintenance quality. Experts proposed complementary strategies such as themed events, digital interpretive tools, community engagement programs, and long-term maintenance plans to sustain these intentions. For example, visitors noted they would only revisit if landscapes offered new activities (e.g., planting festivals, rice field concerts). Experts mirrored this by stressing the importance of rotational programming and seasonal renewal to avoid stagnation. Similarly, visitors' enthusiasm for photography and social sharing aligns with expert strategies to design visual focal points and digital storytelling platforms, making farmland landscapes both aesthetically appealing and socially promotable. Finally, visitors' willingness to participate in light farming and purchase local products is directly supported by expert recommendations for volunteer schemes, product sales points, and farmer–visitor engagement mechanisms. Behavioral intentions highlight that farmland landscapes are not static artifacts but require dynamic management. Experts confirm that ongoing programming, maintenance, and community integration are crucial to transforming one-time visits into long-term patterns of engagement.

5.3 Potential conflicts and coordination and interpretation

While complementarities are dominant, tensions arise between short-term experiential desires and long-term ecological or production needs. Visitors often prioritize aesthetics and interactivity, seeking freedom and novelty, while experts emphasize ecological protection and agricultural feasibility. For instance, large-scale artificial beautification or unrestricted visitor play may compromise ecological integrity, while overly strict ecological zoning risks alienating visitors. The resolution lies in multi-dimensional zoning and layered management: Core ecological protection zones safeguard biodiversity and production, experience zones allow interactivity and play under controlled conditions; educational display zones bridge the two, allowing guided learning about ecology and culture.Such coordination reflects the principle of functional zoning in rural landscapes (Martinus et al., 2024), where spaces are differentiated to balance recreation, ecology, and production. By explicitly

mapping zones and layering experiences, conflicts between freedom vs. protection and order vs. naturalness can be reconciled. This reinforces the idea that farmland optimization is not a one-time design project but an ongoing negotiation between ecological, social, and experiential values.

Overall, the complementarity and coordination between visitor experiences and expert planning form the core logic of farmland landscape optimization. Visitor preferences provide the data foundation for perceptual cognition and behavioral drivers, while expert planning provides systematic scientific and institutional safeguards. Through spatial design, activity planning, and operational management, these perspectives achieve synergistic effects. This integrated discussion not only explains the behavioral motivations of visitors in farmland landscapes but also provides a theoretical and empirical basis for proposing specific optimization strategies.

5.4 Visitor–expert integration matrix

This matrix clearly shows that visitor preferences and psychological needs are largely complementary to expert concerns regarding ecological, social, and planning goals, while potential conflicts exist between interactive design and ecological protection. Therefore, optimization strategies should focus on zoning management, multifunctional space design, and dynamic update mechanisms to balance visitor experience, ecological conservation, and community interests. Moreover, this matrix provides a clear logical basis for the next chapter's specific farmland landscape optimization strategies, ensuring that recommendations are both empirically supported and operationally feasible.6. Farmland Landscape Optimization Strategies

Based on the integrated analysis of visitor experiences and expert insights, this study proposes a systematic set of visitor-centered optimization strategies. These strategies are grounded in ecological protection, supported by community participation, and integrate visual aesthetics, interactivity, and educational value (Table 6). The overarching goal is to enhance rural landscape attractiveness while preserving agricultural functions, thereby supporting agri-tourism integration and rural sustainability.

Table 6. Visitor–expert integration matrix

Visitor Experience Dimension	Core Theme	Typical Example	Expert Focus Dimension	Corresponding Strategy Recommendations	Coordination/Conflict Explanation
Landscape Preferences	Naturalness & Ecological Quality	Unmodified field paths, wild vegetation, interlaced water systems	Ecological function, low-intervention management	Preserve native vegetation, optimize water connectivity	High coordination: visual aesthetics align with ecological protection
	Spatial Order & Visual Aesthetics	Photogenic points, layered terraces	Spatial layout & landscape node design	Design visual focal points, viewing platforms	Coordinated, but balance artificial beautification with naturalness
	Interactivity & Interest	Pickable crops, water activities, educational interaction	Agri-tourism experience planning, educational facilities	Set up picking zones, experience paths, interpretation boards	Partial conflict: interactive zones must control ecological disturbance
Landscape Preferences	Physiological & Safety	Shade, leveled paths, insect prevention	Visitor facilities, safety management	Path paving, rest areas, basic infrastructure	High coordination: facility improvements enhance safety
	Social & Emotional	Family walks, photo check-ins	Community participation, event planning	Parent-child activities, festivals, social spaces	Coordinated; activities enhance social interaction
	Growth & Cognitive	Children's agricultural education, local culture learning	Agricultural education, cultural heritage	Interpretation boards, guided tours, experiential courses	Coordinated; educational functions complement landscape planning
Behavioral Intentions	Revisit Intention	Novel activities, well-maintained environment	Landscape renewal, long-term planning	Regular festivals, landscape rotation, maintenance schedule	Partial coordination: dynamic updates needed to maintain attraction
	Word-of-Mouth & Sharing	Photography and social media sharing	Landscape visual presentation, content dissemination	Design photo points, promote agricultural stories	High coordination: visual sharing enhances landscape attractiveness
	Community Participation & Support	Light farming, purchasing local products	Agri-tourism interaction, sales, community incentives	Volunteer experiences, product sales points, farmer engagement	—

6. Farmland landscape optimization strategies

6.1. Ecological and naturalness strategies

The convergence of visitor preference for authentic landscapes and expert emphasis on ecosystem resilience suggests optimization should prioritize ecological authenticity underpinned by scientific management. Low-intervention management retains original vegetation, field boundaries, and ridges, preserving seasonal rhythms and "wildness" associated with restorative value. This approach simultaneously supports ecological resilience. Enhancing water system connectivity through ditches, ponds, and micro-wetlands improves hydrology and soil quality while creating attractive sites for visitor interaction. Establishing ecological corridors secures wildlife habitats; when paired with interpretation, these corridors serve as cultural-ecological classrooms without compromising conservation goals. These strategies fulfill both visitor desires for naturalness and expert objectives for long-term sustainability.

6.2. Spatial order and visual aesthetic strategies

Spatial order and visual aesthetics are primary visitor attractions and crucial for expert planning. Layered spatial design organizes terraces, fields, and pathways into "discovery–participation–observation" sequences, enhancing spatial legibility and satisfying photographic needs, aligning with Kaplan's preference theory. The strategic use of color and materials (e.g., contrasting crops, seasonal flowers, vernacular materials) strengthens visual identity and regional branding. Visual nodes like viewing platforms and cultural landmarks act as focal points for photography and orientation, addressing visitor demand for "check-in" spots and expert emphasis on spatial identity. These strategies demonstrate that aesthetics functionally bridge experience and ecological planning.

6.3. Interactivity and experiential strategies

Balancing visitor desire for playful freedom with expert needs for controlled engagement is key. Hands-on agricultural activities (e.g., sowing, harvesting) and educational tools (AR/QR codes) transform passive viewing into participatory learning. Designated children's spaces (water-play zones, animal interactions) cater to family bonding and educational goals. Underpinning all interactivity are safety and convenience features (smooth paths, shading, rest facilities), directly addressing fundamental visitor concerns. These strategies actively engage visitors while safeguarding ecological integrity.

6.4. Psychological and social value strategies

Addressing the hierarchical psychological needs identified (comfort → belonging → growth) requires integrated design. Basic infrastructure (leveled paths, sanitation, shade) ensures physiological safety. Social nodes (group rest areas, festival plazas) facilitate bonding and reinforce farmland as a social arena. Educational interventions (guided tours, heritage storytelling) fulfill cognitive growth needs and foster identity building. This layered approach enhances immediate satisfaction and long-term place attachment.

6.5. Behavioral and community participation strategies

Sustaining landscape vitality requires activating visitor behavioral intentions. Revisit intention is stimulated through seasonal events (harvest festivals) and rotating visual highlights. Word-of-mouth sharing is encouraged by designing "Instagrammable" points and agricultural storytelling. Community engagement integrates visitors via volunteer activities, local product purchases, and farmer interactions, strengthening visitor attachment and supporting local economies. These strategies emphasize that optimization requires dynamic operations and socio-economic integration beyond static design.

6.6. Multi functionality and zoning management

Successful implementation hinges on scientific zoning to reconcile diverse demands: About the Ecological Protection Zones, it should prioritize biodiversity and production. At the Viewing Zones, it should emphasize scenic quality and photography. Regarding to Interactive Zones, should allow controlled farming and play experiences. On Educational Zones,it be suggested to provide interpretation and guided tours .

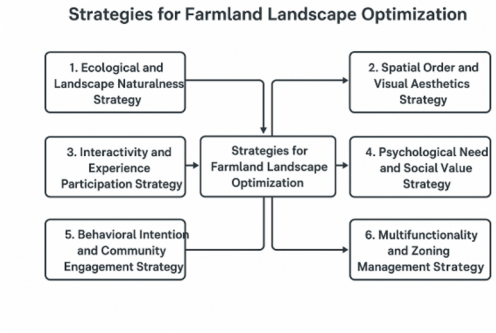

Fig.5: Strategies for farmland landscape optimization, illustrating six key dimensions derived from visitor and expert interview analyses.

By integrating ecological, aesthetic, interactive, psychological, behavioral, and zoning dimensions, this framework establishes a farmland landscape optimization system that is visitor-centered, expert-informed, and ecologically and socially balanced (Figure 5). Such a system not only provides a reference for design practice but also contributes theoretical and methodological insights for policy-making and rural revitalization initiatives. Ultimately, farmland landscapes become multi-functional socio-ecological systems that satisfy visitor needs, sustain agricultural production, and strengthen community resilience.

7. Contribution, limitation and future research

Theoretically, this study establishes a threefold contribution to rural landscape planning. First, it extends the ecology-production-tourism integration perspective by conceptualizing farmland landscapes as multifunctional socio-ecological systems that simultaneously enhance ecological resilience, agricultural productivity, and tourism attractiveness. Second, it advances landscape preference theory by demonstrating, through photo-elicitation interviews (PEI), how specific elements natural vegetation, water systems, and interactive features directly shape visitor perceptions and behavioral intentions. Third, it validates the application of Social-Ecological Systems (SES) theory to agricultural contexts, revealing how community participation and visitor interactions form adaptive cycles that negotiate between ecological sustainability and socio-cultural vitality. Practically, the optimization framework provides actionable strategies for key stakeholders. Planners can implement the proposed multifunctional zoning system integrating ecological protection, viewing, interactive, and educational zones—to balance conservation and experience. Agritourism operators can address the hierarchical psychological needs (comfort, belonging, growth) through layered design incorporating safety infrastructure, social nodes, and educational interpretation. Local communities benefit from participatory mechanisms that strengthen place identity through volunteer programs and local product engagement. Collectively, these approaches demonstrate that sustainable farmland optimization requires aligning visitor-centered design with ecological management through dynamic, scientifically-grounded planning.

The study is based on data from Zhanjiang city in Lingnan region and relies on a relatively small group of visitors and experts. Consequently, the representativeness and generalizability of the findings require more figures validation through larger and more diverse studies.This research also holds the limitation, as the absence of cross-seasonal data restricts contextual generalization. Future research using methods integrating GIS and VR technologies could support multiple-function farmland landscape design.

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