

## **Revitalizing Batak Gastronomy: Sustainable Culinary Tourism Through Local Food and Beverage Service Innovation in North Sumatra**

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### **Abstract**

Culinary tourism has developed into a key strategy in building the attraction of destinations and reviving local cultural heritage. This study aims to analyze how food and beverage service (F&B) innovations can encourage the revitalization of Batak gastronomy in North Sumatra through the role of sustainability mediation and tourist experience. This study uses a mixed method approach, with qualitative data collection through in-depth interviews and participatory observations of culinary business actors, as well as quantitative surveys of 200 domestic tourists. Multiple regression analysis and mediation tests (Sobel and Bootstrap) were used to test the relationships between variables. The results show that F&B service innovations, such as the insertion of cultural narratives, the digitization of services, and the organization of culinary workshops, have a significant influence on the perception of sustainability and the quality of the tourist experience. Sustainability that includes environmental, social, and economic aspects partially mediates the relationship between innovation and revitalization, while the traveller experience is the most dominant mediator. The conceptual model developed shows that the combination of innovation, sustainability, and tourism experiences forms a culinary service system that is culturally relevant, market-oriented, and long-term resilient. The conclusion of this study emphasizes the importance of an integrative approach in the development of local culinary tourism. Local governments, destination managers, and the culinary community need to collaborate in designing F&B service strategies that focus not only on increasing competitiveness, but also on preserving cultural identity and applying sustainability principles. This study recommends replicating this model in the context of other ethnic cuisines in Indonesia as a strategic framework towards inclusive and sustainable tourism development.

**Keywords:** Batak gastronomy, service innovation, sustainability, tourism experience, culinary revitalization, North Sumatra.

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### **A. INTRODUCTION**

The development of tourism in the 21st century places gastronomy as one of the distinguishing factors of competitive tourist destinations (Kuhn, 2024). Innovation and creativity in *gastronomic tourism* have been identified as the main pathways to strengthen local culinary identities while responding to market pressures and sustainability demands (Kuhn, 2024). On the global side, programs such as *Slow Food Travel run* by the United Nations and its partners encourage gastronomic tourism that supports rural communities, promotes local supply chains, and preserves culinary traditions as part of sustainable ecotourism. In the Indonesian context, gastronomic strategies are also increasingly combined with national branding efforts and culinary diplomacy (*gastrodiplomacy*). Programs such as "Indonesia Spice Up the World (ISUTW)" are examples of national policies that want to make culinary an element of cultural diplomacy and the

creative economy. However, although the program is national-scale, there is still little research exploring how culinary service innovations at the local level (e.g. ethnic areas such as Batak) can be integrated with sustainability strategies and tourism experiences within the framework of culinary tourism (The Practice of Indonesian Gastrodiplomacy, 2025).

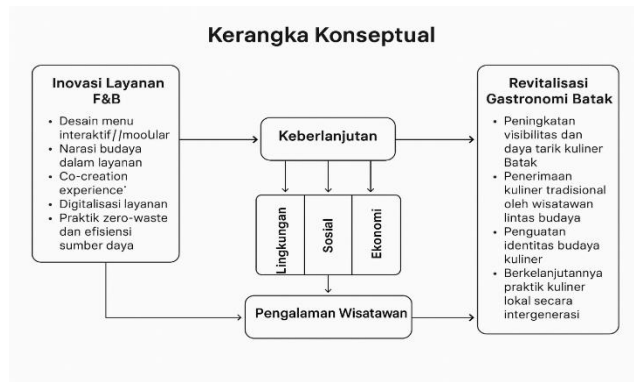
In addition, recent developments in the culinary tourism literature highlight the integration of digital and social media elements as a catalyst for unforgettable travel experiences and revisiting intentions. For example, a study in Magelang Regency found that the *authenticity of food* and social media exposure directly influenced tourists' intentions to revisit through unforgettable gastronomic experiences (Hurdawaty, 2025). This research confirms that in the modern context, cultural and digital aspects cannot be separated in designing destination culinary strategies. The case study in Labuan Bajo is also interesting: Teguh (2025) examines how local gastronomy can diversify tourism products by integrating culinary as a major attraction along with nature tourism. Research shows that innovation efforts in the culinary field are able to enrich the tourist experience and expand the attraction of destinations (Teguh, 2025). Similarly, the global movement *Transforming Gastronomy Tourism through Innovation* emphasizes that innovative solutions including waste management technologies, local food storytelling, and new service solutions are key to sustainable culinary transformation (2024).

On the environmental and sustainability side, recent research trends highlight the use of technologies such as *AI-generated imagery* to enrich the content of gastronomic destinations and reinforce visual sustainability narratives in culinary marketing (Chan, 2025). This shows that the visual and digital dimensions are now also an integrative part of the modern gastronomic tourism strategy. Although the potential for culinary tourism is enormous, real challenges often arise: the risk of commercialization that degrades cultural authenticity, dependence on imported ingredients, and the gap in economic benefits between large businesses and local micro-enterprises (Baykal et al., in *Gastronomy for Sustainable Tourism Destination Marketing*). In the Batak context, culinary potentials such as *saksang*, *arsik*, *andaliman*, and traditional eating rituals have not been optimized as part of an innovative and sustainable service system, especially when combined with digital technology and the active participation of tourists.

Food tourism has undergone a significant transformation in the past two decades, from simply tasting local food to a complex, reflective, and aesthetically pleasing cultural experience. Terms such as culinary tourism, *culinary tourism*, and *Gastronomic Tourism* It is now used more specifically to distinguish the level of depth and meaning of food-based tourism activities. *Culinary tourism* generally refers to tourism activities that involve the consumption of local food as part of an itinerary, while *Culinary Tourism* emphasizing the active interaction of tourists with the culinary process, whether through the participation of cooking classes, traditional market tours, or other culinary activities. As for *gastronomic tourism*, as a further development, emphasizing a more reflective experience, including cultural narratives, local identities, symbolic values, and a complete multisensory experience, making food a medium to interpret the identity of a destination (Putra, 2024; Nistor & Dezsi, 2022). In this context, sustainability is a basic principle in the development of modern culinary tourism. It is no longer enough if culinary tourism only offers delicious food; He is required to support a fair local food system, protect the environment, and empower communities. (Safaei, dos Anjos, & Krause, 2023) emphasizing the importance of a sustainable culinary system that includes service innovation, local engagement, and environmental impact in an integrated manner in the gastronomic sector. This is in line with a holistic approach in looking at the culinary service system from upstream to downstream. In

another perspective, food service is not only an economic activity, but also a medium of cultural representation and social dynamics. In line with that, service innovation in the food and beverage (F&B) sector is now a strategic element in increasing the competitiveness of gastronomic destinations. Innovation is not limited to technological aspects such as menu digitization or online ordering systems, but also includes more immersive experience design, such as co-creation experiences, personalized modular menus, and cultural narratives embedded in services. A study by Safaei et al. (2023) emphasizes that service innovations based on local cultural values tend to be more accepted by tourists, as they are considered authentic and valuable. In fact, in the post-pandemic context, the adoption of digital technology in F&B services is one of the important transformations that not only improves operational efficiency, but also supports sustainability, for example by reducing paper waste and improving energy efficiency (Alonso et al., 2022).

However, the success of service innovation in culinary tourism is greatly influenced by the local socio-cultural context. A study by Graham (2021) shows that innovations that are too modern or too far from cultural roots can generate resistance, both from local communities and tourists looking for authenticity. Therefore, service innovation must be contextually designed and sensitive to local values. In this case, sustainable culinary tourism demands a balance between innovation, sustainability, and cultural authenticity. In addition to great economic potential such as job creation, strengthening the local agricultural sector, and improving the image of culinary tourism destinations, it also brings challenges that are not light. The risk of excessive commercialization, degradation of cultural values, and inequality of economic benefits between large actors and MSMEs are crucial issues that are often overlooked. Therefore, a culinary destination development strategy must integrate all dimensions of sustainability simultaneously: economic, environmental, social, and cultural. In this context, culinary tourism is not only a tourism product, but an instrument of strategic local socio-cultural and economic transformation.



**Figure 1. Conceptual framework**

The conceptual framework in this study describes the systematic relationship between food and beverage service (F&B) innovation, sustainability, tourist experience, and revitalization of Batak gastronomy. F&B service innovation is positioned as an independent variable and a key driver of change, encompassing interactive menu design, cultural narratives, co-creation experiences, digitization of services, and the implementation of eco-friendly practices. This innovation not only improves the quality of services, but also strengthens tourists' connection with local culture. These innovations interact with environmental, social, and economic sustainability dimensions that bridge their influence on culinary revitalization. Environmental aspects include the use of local materials and resource efficiency; social aspects include

community involvement and preservation of cultural values; while the economic aspect focuses on increasing local economic value and expanding the Batak culinary market. Sustainability also strengthens the traveller experience which is judged from the perception of authenticity, satisfaction, emotional connectedness, and intention to revisit. The more synergistic innovation and sustainable practices are, the deeper the culinary tourism experience will be. This contributes directly to the revitalization of Batak gastronomy as a dependent variable, which includes increased culinary appeal, cross-cultural recognition, strengthening local identity, and cross-generational preservation. The relationship between these variables influences each other, emphasizing the importance of an integrative approach in the development of sustainable culinary tourism.

This research is here to fill a number of gaps that are still found in the literature on Batak gastronomy. Previously, most research focused more on aspects of culinary identity, traditional food documentation, and general perceptions of tourists (Darwis, 2021; Rakhman et al., 2024). However, there have not been many studies that systematically place food and beverage (F&B) services as a strategic medium in gastronomic revitalization. This research makes an important contribution by making F&B service innovation a key variable in the transformation of the Batak culinary system. In addition, the sustainability approach in previous studies tends to be descriptive and has not explicitly integrated the three main dimensions of environmental, social, and economic sustainability into culinary practices. There is no model that comprehensively combines service innovation with sustainability principles in the Batak local context. Therefore, this study formulates a conceptual model based on a sustainable culinary system that adopts a holistic and integrative approach.

This study answers the limitations of previous studies that tend to focus on Batak culinary identity and tourist satisfaction in general, without examining the strategic role of F&B service innovation in revitalizing gastronomic heritage. While most innovation studies are centered in urban areas such as Java and Bali, the Batak context in North Sumatra is still rarely touched on in a systematic way. This research comes with a contextual approach to identify forms of F&B service innovation that are in accordance with Batak culture, as well as analyze their contribution to local culinary preservation. Sustainability aspects are also rarely studied comprehensively, especially the integration of environmental, social, and economic dimensions in local culinary practices. On the other hand, the tourist experience has not been widely explored as a factor that mediates the success of innovation. This research builds a conceptual model that links service innovation, sustainability, and tourist experience with the revitalization of Batak gastronomy, while providing evidence-based recommendations for innovative, sustainable, and culture-based culinary development strategies.

## **B. RESEARCH METHODS**

This study uses a mixed method approach with an explanatory design that begins with qualitative exploration to understand the phenomenon in depth, followed by a quantitative approach to test the relationship between variables and strengthen the generalization of results. This approach was chosen because the issue of gastronomic revitalization through sustainable F&B service innovation is not only technical, but also heavily influenced by the social, cultural, and subjective perceptions of actors and tourists.

### **Location and Research Subject**

The research was conducted in the North Sumatra region which has a high concentration of Batak culinary characteristics, including in Samosir Regency, Toba Regency, Karo Regency, and

Medan City. This location was chosen deliberately because it has a diversity of Batak culinary practices that are still sustainable and are starting to be developed as part of a cultural and nature-based tourist destination. The subjects of the study include three main categories: (1) Batak culinary business actors, such as restaurant owners, cooks, and operational managers; (2) domestic and foreign tourists who visit Batak culinary destinations; and (3) local stakeholders such as the tourism office, cultural figures, and culinary creative communities.

### **Data Collection Techniques**

In the qualitative phase, data is collected through four main techniques. First, in-depth interviews were conducted with 15 Batak culinary business actors to explore the forms of F&B service innovations that have been or are being implemented, the motivations behind these innovations, and the challenges in their implementation. The interview also includes their perceptions of sustainability and local community involvement. Second, the Focus Group Discussion (FGD) was held with two groups, namely small business actors (culinary MSMEs) and tourism stakeholders, to explore the collective perception of the needs, potentials, and directions of culinary innovation that is in harmony with the local culture and environment. Third, participatory observations were carried out in several Batak restaurants and stalls to record service flows, interactions between waiters and customers, the use of cultural narratives in services, and sustainability practices such as waste management and the use of local materials. Fourth, visual documentation in the form of photos, videos, and promotional materials was collected as supporting evidence to strengthen the descriptive findings.

Meanwhile, in the quantitative phase, data collection was carried out through the distribution of a closed questionnaire with a 5-point Likert scale to 200 tourists who had enjoyed Batak culinary at the research site. The questionnaire was designed to measure travelers' perceptions of service innovation, sustainability of service practices, gastronomic experiences (including perceptions of authenticity, satisfaction, and emotional connection to local culture), as well as post-visit behavioral intentions such as intention to recommend and intention to return. This approach allows for robust triangulation of data between qualitative and quantitative findings.

### **Research Instruments and Validity**

The interview instruments and questionnaires were developed based on the latest literature review on sustainable gastronomy, service innovation, and tourism experience theory (MTE). The validity test of the content was carried out through a review by three experts in the field of tourism and culinary culture, while the reliability of the questionnaire was tested using Cronbach's Alpha with a minimum value of 0.7 as the accepted threshold.

### **Data Analysis Techniques**

This study uses a mixed approach, integrating qualitative analysis through the Braun & Clarke thematic method and quantitative analysis using descriptive statistics and multiple linear regression. The qualitative analysis identified patterns of service innovation, challenges, and sustainability practices from the interview and FGD data, while the quantitative analysis examined the relationships between variables using SPSS and NVivo.

Four main variables were studied: F&B service innovation (independent), sustainability (mediator), tourist experience (moderator), and revitalization of Batak gastronomy (dependent). Service innovation includes service design, cultural narrative, co-creation, and digitalization. Sustainability is analyzed through environmental, social, and economic dimensions. The traveler's experience includes perceptions of authenticity, satisfaction, emotional closeness, and behavioral intent. Revitalization is measured through cultural appeal, market acceptance, and sustainability across generations. The structure of these variables allows for systematic and valid relationship testing through method triangulation.

### **Research Ethics**

All research procedures adhere to the ethical principles of social research, including informed consent, confidentiality of respondent data, and the right to withdraw from research at any time. This research has received ethical approval from the academic institution that houses the researcher.

## C. FINDINGS AND DISCUSSION

### Qualitative Findings

#### Local forms of service

The results of in-depth interviews and participatory observations revealed five main forms of F&B service innovation in Batak restaurants/restaurants in the Samosir, Toba, Karo, and Medan areas:

**Table 1. In-depth interviews and participatory observations**

No	Types of Innovation	Example Practice	Interview Quotes
1	Modular Menu	Spicy level options, extra optional, flexible fish	"We wanted customers to be able to choose their own level of 'Batak flavor', so we made this menu interactive." ( <i>Owner of Toba Heritage Restaurant</i> )
2	Cultural Narrative	Description of the menu with cultural stories, use of Batak terms	"Not only do they eat arsik, but they also know that this is the ritual food of the wedding in my village." ( <i>Samosir Restaurant Chef</i> )
3	Culinary Workshop	Visitors learn to make tuktuk sambal, arsik fish flavor	"This is the first time I have cooked directly using andaliman, it tastes unique and funny." ( <i>Tourist, FGD</i> )
4	Digital Services	Menu via QR code, online reservation system	"We use this app to make it more practical and eco-friendly." ( <i>Restaurant manager in Medan</i> )
5	Sustainable Practices	Organic waste composting, biodegradable packaging	"We invite the staff to sort our waste, and the rest of our vegetables to make kitchen herbal plant fertilizer." ( <i>Samosir Culinary Entrepreneur</i> )

Batak culinary business actors began to adopt various forms of service innovations that not only adapted to the preferences of modern tourists, but also maintained local cultural values. One of the key innovations is a modular and interactive menu that allows customers to customize their dishes, such as choosing a level of spiciness or adding andaliman, while still maintaining the typical Batak flavor. Other innovations include the insertion of cultural narratives in the restaurant's menu and atmosphere, including explanations of the origin of the dish, the symbolism of the ingredients, and the atmosphere tinged with traditional music. This approach deepens the tourist's emotional connection to the local culture through meaningful culinary experiences.

The active participation of tourists is also encouraged through cooking workshops, interactions with local ingredients, and spice demonstrations, reflecting the principles of the economy of experience in tourism. Meanwhile, the digitization of services such as QR menus and online reservations shows the adaptation of technology that increases efficiency and environmental awareness, although it is still limited to middle-to-upper business actors. Sustainable efforts such as organic waste management, the use of local materials, and eco-friendly packaging are beginning to be adopted, reflecting the growing ecological awareness. This innovation in Batak F&B services is contextual in nature, combining modernity with cultural roots and has the potential to become a model for the development of culinary based on local wisdom in Indonesia.

#### Sustainability Practices in Service Innovation

Based on observations and interviews, there is a correlation between the quality of innovation and the integration of sustainability practices:

- Environmental dimension: restaurants with digital menus and in-house composter systems are more consistent in reducing plastic waste and food waste. Some restaurants in Samosir report that more than 60% of kitchen waste has been sorted and composted.
- Social dimension: local communities (spice farmers, freshwater fishermen) are included as raw material supply partners. In one case, a restaurant in Karo bought andaliman directly from local farmers at a premium price as an incentive.

- Economic dimension: small businesses benefit from tourists willing to pay a premium for authenticity and sustainable practices. Some players say that profit margins have increased by 5-10% thanks to the "story & sustainability" strategy in their menus.

### Quantitative Findings: A Tourist Survey Analysis Respondent Profiles and Descriptive Statistics

Of the 200 questionnaires distributed, 187 respondents (93.5%) were valid and used in the analysis. Brief profile:

- The majority are 25–45 years old ( $\pm$  58%)
- Domestic ( $\pm$  70%) and international ( $\pm$  30%)
- 1  $\geq$  Batak destination visit experience ( $\pm$  65 %)

Descriptive statistics on the main variable showed that the average score of service innovation perception (X1) was  $M = 3.85$  ( $SD = 0.62$ ); perception of sustainability (X2)  $M = 3.78$  ( $SD = 0.67$ ); tourist experience (Z)  $M = 3.92$  ( $SD = 0.55$ ); and perception of revitalization (Y)  $M = 3.70$  ( $SD = 0.70$ ). This score shows that in general respondents tend to give positive assessments of innovation, sustainability, and revitalization, but the variability is quite pronounced ( $SD > 0.5$ ) indicating room for improvement.

**Table 2. Descriptive Statistics of Key Variables**

Variable	Average (Average)	Standard Deviation (SD)
F&B Service Innovation (X1)	3,85	0,62
Perception of Sustainability (X2)	3,78	0,67
Traveler's Experience (Z)	3,92	0,55
Gastronomic Revitalization (Y)	3,70	0,70

A review of tourist perceptions of the four main variables of *F&B service innovation*, *sustainability*, *tourist experience*, and *Batak gastronomic revitalization* showed generally positive results. The F&B service innovation variable obtained an average of 3.85 ( $SD = 0.62$ ), reflecting appreciation for interactive menus, cultural narratives, and digitization of services, with fairly consistent perceptions among respondents. Sustainability achieved an average score of 3.78 ( $SD = 0.67$ ), indicating recognition of efforts to use local materials, waste management, and energy efficiency, although the perception is not completely evenly distributed, especially in environmental and social aspects.

The traveller's experience recorded the highest score, 3.92 ( $SD = 0.55$ ), indicating a satisfying, authentic, and emotional culinary experience, with a homogeneous perception that reinforces the validity of the results. On the other hand, the revitalization of Batak gastronomy obtained an average score of 3.70 ( $SD = 0.70$ ), indicating that the revitalization process is still ongoing and not optimal according to some tourists. Overall, these results confirm that service innovation and quality of tourism experience are the main forces in encouraging Batak culinary revitalization. However, to achieve full success in the development of sustainable culinary tourism, the sustainability aspect and tangible impact on cultural preservation need to be strengthened.

**Table 3. Multiple Regression Analysis**

Type	Independent Variables	$\beta$ (Beta)	p-value	Information
1	Service Innovation $\rightarrow$ Sustainability	0,63	$< 0.001$	Significant positives
2	Innovation + Sustainability $\rightarrow$ Experience	0,35 0,41	$< 0.01 < 0.001$	Both are important
3	Innovation + Sustainability + Experience $\rightarrow$ Revitalization	0,20 0,28 0,45	$< 0.05 < 0.01 < 0.001$	All significant and most dominant experiences

$R^2$  (Model 3) = 0.68  $\rightarrow$  the third variable explains 68% of the variation in Batak gastronomic revitalization.

The results of the analysis showed a strong and significant relationship between the variables of F&B service innovation, sustainability, tourist experience, and Batak gastronomic revitalization. In **Model 1**, F&B service innovation had a significant positive effect on sustainability perceptions ( $\beta = 0.63$ ;  $p < 0.001$ ), indicating that the higher the innovation felt by tourists, the greater their perception of sustainable culinary practices.

**Model 2** shows that service innovation ( $\beta = 0.35$ ;  $p < 0.01$ ) and sustainability ( $\beta = 0.41$ ;  $p < 0.001$ ) together affect the traveller experience, with an  $R^2$  of 0.52. It confirms that immersive culinary experiences are shaped by a combination of service creativity and sustainability values in restaurant operations.

In **Model 3**, the three variables of *service innovation, sustainability, and tourism experience* had a significant effect on the revitalization of Batak gastronomy, with  $\beta$  of 0.20 ( $p < 0.05$ ), 0.28 ( $p < 0.01$ ), and 0.45 ( $p < 0.001$ , respectively). Tourist experience was the most dominant factor, while an  $R^2$  value of 0.68 indicated that almost 70% of the variation in the perception of revitalization could be explained by this model.

Overall, these results confirm that the success of culinary revitalization is not only determined by technical innovation, but also requires the integration of sustainability values and the creation of authentic and emotional experiences. This integrative approach is important to build a sustainable culinary destination ecosystem that reinforces each other between variables.

**Table 4 Results of the Sustainability and Tourist Experience Mediation Test**

Mediation Pathway	Line Coefficient ( $\beta$ )	Sobel z	p-value	CI Bootstrap (95%)	Information
X1 → X2 (Sustainability)	0,63	—	< 0.001	—	Significant
X2 → Y (Revitalization)	0,28	—	< 0.01	—	Significant
<b>X1 → X2 → Y</b>	—	3,26	< 0.01	0,092 - 0,243	<b>Significant mediation</b>
X1 → Z (Traveler Experience)	0,35	—	< 0.01	—	Significant
Z → Y (Revitalization)	0,45	—	< 0.001	—	Significant
<b>X1 → Z → Y</b>	—	3,98	< 0.001	0,144 - 0,301	<b>Significant (strong) mediation</b>

**Information:**

- **X1** = F&B Service Innovation
- **X2** = Sustainability
- **Z** = Travel Experience
- **Y** = Revitalization of Batak Gastronomy
- **CI** = Bootstrap 5,000 Resampling Confidence Interval
- **The X1 → X2 → Y and X1 → Z → Y** lines were tested separately and in parallel models

To test the role of sustainability (X2) and tourist experience (Z) as mediators in the relationship between F&B service innovation (X1) and Batak gastronomic revitalization (Y), Sobel and bootstrap tests were used (5,000 resampling, 95% CI). The results of the analysis showed that the two mediated significantly. Sustainability mediated some of the influence of innovation on revitalization, with line coefficients X1 → X2 ( $\beta = 0.63$ ,  $p < 0.001$ ) and X2 → Y ( $\beta = 0.28$ ,  $p < 0.01$ ). The Sobel test showed  $z = 3.26$  ( $p < 0.01$ ), and bootstrap yielded a CI: 0.092–0.243 (not passing zero), confirming significant mediation. This means that the perception of sustainability is an important path in connecting innovation and revitalization. Similarly, the travel experience is also a significant mediator. Innovation had an effect on experience ( $\beta = 0.35$ ,  $p < 0.01$ ), which then influenced revitalization ( $\beta = 0.45$ ,  $p < 0.001$ ). The Sobel test yielded  $z = 3.98$  ( $p < 0.001$ ) and a bootstrap CI: 0.144–0.301. When tested together in a parallel mediation model, the travel experience showed a stronger mediating influence than sustainability. This is natural because experience is direct and emotional, while sustainability is more implicit and conceptual.

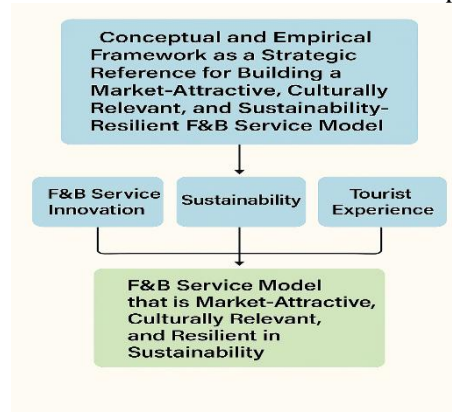
Overall, these results confirm that the impact of service innovation on revitalization is not direct, but mediated by perceptions of sustainability and tourism experiences. These findings support the theory of *co-creation* and *memorable tourism experience*, and demonstrate the need for a holistic approach in the development of culinary destinations emphasizing not only technical innovation, but also social, environmental, and visitor experience aspects.

### Discussion of Findings

This study empirically shows a strong relationship between F&B service innovation, sustainability, and tourism experience with the revitalization of Batak gastronomy in North Sumatra. Service innovation is not just a creative element, but a catalyst for the transformation of a culturally inclusive, sustainable, and contextual culinary system. The presentation of interactive menus, cultural narratives, culinary workshops, and digitization of services has been proven to increase the positive perception of tourists and strengthen their attachment to Batak culture. Theoretically, these findings support *a co-creation approach* (Prahalad & Ramaswamy, 2004), in which the value of experiences is created from the active involvement of tourists. Participation in the cooking process and exploration of culinary stories forms a more meaningful experience. This research also fills a gap in the literature, especially regarding the integration of culture-based service innovation and sustainability in Indonesia's traditional culinary sector which has not been systematically explored.

Tourism experiences have proven to be the strongest mediator between service innovation and revitalization, indicating that authentic and emotional experiences have a great influence on the perception of the value of Batak's culinary heritage. This means that the revitalization strategy must be designed so that tourists not only see, but experience firsthand the culinary culture. In contrast, the role of sustainability mediation is still less prominent because its values have not been fully internalized by tourists. Therefore, explicit communication about sustainability practices such as information on local ingredients, waste management systems, and supply chains needs to be strengthened to increase awareness and participation of tourists in responsible culinary systems. The findings also highlight the structural challenges faced by local culinary actors, such as limited access to technology, low managerial capacity, and lack of policy support. The implication is that the support of the government and related institutions is needed through innovation training, technology incentives, and strategic partnerships with the creative industry. Without systemic interventions, individual innovation is difficult to develop sustainably.

Strategically, this research contributes to the formulation of culture-based tourism policies in North Sumatra. The resulting conceptual framework and empirical evidence can serve as a guide for local governments, industry players, and the culinary community in building market-adaptive, culturally relevant, and environmentally resilient F&B services. Batak culinary innovations must be understood in the context of local social and cultural culture, so that they can be internalized in a complete culinary system and translated into authentic and memorable tourist experiences. With this approach, the revitalization of Batak gastronomy has the potential to become the foundation for inclusive and sustainable tourism development.



**Figure 2 . conceptual framework and empirical evidence as a strategic reference**

A conceptual framework that integrates F&B service innovation, sustainability, and tourism experiences in efforts to revitalize Batak gastronomy is a relevant and applicable approach to the development of culinary tourism based on local culture. This framework not only reflects the theoretical linkages between variables, but has also been empirically validated through consistent quantitative and qualitative data. In the context of destination development policy and strategy implementation, this framework can be used as a practical reference for local governments, destination managers, and culinary communities to design a holistic and sustainable food and beverage (F&B) service model. This model emphasizes that the success of local culinary revitalization is determined not only by innovation on the product or service side of the display, but also by the extent to which cultural values and sustainability principles are internalized into the operational system and customer experience.

In particular, local governments can use this framework to develop innovation-based training programs and service sustainability, provide incentives to culinary business actors that implement environmentally friendly and cultural-based practices, and facilitate collaboration between F&B actors, cultural communities, and the digital technology sector. Tourism destination managers can redesign the flow of the traveler experience to include participatory elements such as culinary workshops, food stories, and hands-on exposure to sustainability practices. Meanwhile, local culinary communities can use this framework as a foundation to build a collective gastronomic identity that not only prioritizes the uniqueness of taste, but also demonstrates social and environmental responsibility. Thus, the conceptual model and empirical evidence in this study not only serve as an analytical framework, but also as a strategic navigation tool to strengthen the competitiveness of culinary destinations, deepen cultural significance in services, and create local culinary systems that are resilient to market dynamics and long-term sustainability challenges.

#### **D. CONCLUSION**

This research comprehensively shows that the revitalization of Batak gastronomy in North Sumatra cannot be separated from the synergy between F&B service innovation, the application of sustainability principles, and the creation of authentic tourism experiences. Through a mixed method approach, the empirical findings of this study successfully reveal that service innovations such as the insertion of cultural narratives, the development of interactive menus, digitalization, and participatory culinary experiences are able to increase tourists' perception of service quality and linkage to local culture. These innovations not only increase the competitiveness of restaurants or culinary ventures, but also form a strong perception of the value of sustainability and cultural significance in consumption practices.

In addition, sustainability has proven to play an important mediating role, where the implementation of eco-friendly practices, the use of local ingredients, and community empowerment not only strengthen the legitimacy of culinary services, but also add cultural and ethical value to tourists' dining experiences. On the other hand, the traveler experience has emerged as the most powerful mediating factor in bridging innovation and revitalization. A positive, emotional, and culturally nuanced experience not only increases visitor satisfaction, but also forms an intention to return, spread positive stories, and strengthen the Batak culinary image as part of the destination's identity. The conceptual models developed in this study offer significant theoretical and practical contributions. Theoretically, this model expands the framework of thinking in the culinary tourism literature by placing the travel experience and sustainability as an integral component in the process of innovation and revitalization. Meanwhile, in practice, this model can be used as a reference by local governments, industry players, and local communities in designing F&B service strategies that not only focus on economic value, but also pay attention to cultural relevance and flexibility to long-term sustainability issues.

However, the study also acknowledges limitations, especially in geographical coverage which is still focused on a few locations in North Sumatra and does not cover the entire broader Batak culinary heritage. Therefore, further research is recommended to adopt a comparative approach between local culinary ethnicities in Indonesia, as well as integrate the perspectives of international tourists more deeply to gain a more holistic cross-cultural understanding. Future research is also expected to develop sharper quantitative indicators in measuring the success of culinary revitalization, as well as explore the involvement of local young people in sustainable gastronomic transformation. Thus, it can be concluded that the revitalization of Batak gastronomy is not only about reviving traditional foods, but also about building a culinary service system that is rooted in local culture, adapts to market needs, and contributes to the sustainable development of tourism. Service innovation, sustainability, and the traveller experience are not separate entities, but strategic nodes that are interconnected and form the foundation of a resilient, inclusive, and long-term value culinary destination transformation.

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