Ethnogastronomic study of malay gulai masam in North Sumatra: preserving traditional culinary heritage to support food security

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Abstract. Gulai Masam is a traditional dish of the Malay community in North Sumatra, reflecting the region's biodiversity and local knowledge. This study aims to identify the species of food ingredients used in Gulai Masam, as well as to explore its cultural values and contribution to local food security. The research was conducted using a qualitative ethnobiological and ethnogastronomic approach in six Malay regions of North Sumatra. Data were collected through interviews with 27 key informants and participatory observations. The findings reveal that Gulai Masam incorporates 33 species of food ingredients from 26 family, consisting of 12 animal-based main ingredients and 21 plant-based spices and herbs. These ingredients are sourced from traditional markets, cultivated, and the wild. The preparation process also serves as a medium for transmitting ecological and cultural knowledge across generations. The diversity of ingredients highlights the potential of this dish as a model for an adaptive and sustainable local food system. This study affirms that Gulai Masam holds not only culinary value but also plays a strategic role in biodiversity conservation and in strengthening food security based on local wisdom.

1 Introductions

Indonesia is recognized as a megabiodiversity country with an extraordinary wealth of cultural and biological resources. This richness is reflected in various aspects of community life, one of which is culinary tradition [1]. Traditional food not only serves to meet biological needs but also carries social, cultural, symbolic, and ecological values embedded in the daily practices of a community [2]. In this context, the study of ethnogastronomy becomes important as an interdisciplinary approach to understanding the relationship between food and culture within the framework of identity and local wisdom.

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Ethnogastronomy is a branch of science that examines the relationship between food, culture, history, and the identity of a particular community [3]. Unlike conventional gastronomy, which focuses more on taste and cooking techniques, ethnogastronomy emphasizes the social, ecological, and symbolic aspects of culinary practices [4]. This approach is highly relevant in addressing global challenges related to the preservation of local culture, food security crises, and the sustainability of natural resources [5]. Through ethnogastronomic studies, traditional foods can be promoted as part of sustainable development strategies rooted in local wisdom [6].

One of the communities with a rich culinary heritage and strong traditions is the Malay community in North Sumatra. This ethnic group preserves various forms of cultural heritage, including cuisine that reflects adaptation to the environment, the use of local biological resources, and social values passed down through generations [7]. Among the many traditional dishes that remain preserved, Gulai Masam stands out as a distinctive dish that holds an important role in the lives of the Malay people.

Gulai Masam is a dish made from fish or meat combined with a variety of spices and natural souring agents derived from local plants. Its presence in Malay society extends beyond culinary value, encompassing deep cultural significance. The preparation, serving, and consumption of Gulai Masam are part of social rituals, traditional ceremonies, and symbols of hospitality and ancestral respect [8]. It represents ethnic identity, strengthens social solidarity, and serves as a medium for transmitting cultural knowledge across generations [9]. This illustrates that traditional food carries a broader dimension beyond mere consumption it is also a medium of cultural expression and social resilience.

Amid the waves of globalization and modernization of food systems, the existence of Gulai Masam as a culinary heritage is facing serious challenges. Younger generations tend to prefer fast food and modern food products, which are considered more practical and instant [10]. As a result, traditional foods are becoming marginalized and even risk extinction if preservation efforts are not immediately undertaken. The loss of traditional foods also means the loss of cultural values, local knowledge, and biodiversity that have been passed down through generations.

To date, there has been little research specifically addressing the biodiversity embedded in traditional Malay cuisine. In fact, a combined approach of ethnobiology and gastronomy is crucial to uncover this knowledge. Gulai Masam is not merely a dish it is an integral part of Malay cultural identity. Therefore, it is essential to study the plant- and animal-based ingredients used in this dish as a step toward cultural preservation and as a foundation for developing valuable local food data for the future.

2 Research method

This study employed a descriptive qualitative approach using ethnobiological and ethnogastronomical perspectives. The ethnobiological approach was applied to identify and document the species of food ingredients and the specific parts used in the preparation of Gulai Masam, while the ethnogastronomical approach aimed to explore the social and cultural values embedded in the use of these ingredients within the culinary context of the Malay community in North Sumatra.

The research was conducted from January to April 2023 in several regions of North Sumatra with significant Malay populations that continue to preserve their traditional culinary practices. These regions included the city of Medan, and the regencies of Deli Serdang, Serdang Bedagai, Langkat, Batubara, and the city of Tanjung Balai. The locations were selected purposively based on the continuity of traditional culinary practices and the availability of local food ingredients.

The subjects of this study were individuals identified as key informants, namely community leaders/customary leaders and cooks. Informants were selected purposively based on the following criteria: (1) residing in the research area, (2) being directly involved in the culinary practices of Gulai Masam, and (3) being willing to provide open information.

Data collection techniques were used to obtain comprehensive and in-depth information on the food ingredients used in Gulai Masam and their role in local food security. The data collection methods included:

In-depth interviews: Semi-structured interviews were conducted with 27 key informants, consisting of community leaders/customary leaders and experienced cooks who are skilled in preparing Gulai Masam. The interview questions were designed to explore information about the species of food ingredients used, the parts utilized, sources of ingredients, and the cultural values embedded in the preparation process.

Participant observation: This technique involved direct observation and documentation by the researcher, who participated in the preparation process of Gulai Masam.

Plant taxonomy identification was based on local names obtained from informants, which were then cross-referenced with standard taxonomic references such as The Plant List, Catalogue of Life, and primary sources such as Flora Malesiana (van Steenis, 1950–present), Plant Resources of South-East Asia (PROSEA), and www.tropicos.org.

The data obtained from interviews were analyzed qualitatively. Field data were categorized based on: the species of food ingredients used in Gulai Masam, along with their scientific names and parts used; sources of these ingredients; the role of local food in preserving Malay cultural heritage; and the cultural values and symbolic meanings of the ingredients and the dish itself.

3 Result and discussion

3.1 Species of food ingredients in gulai masam

Based on interviews with key informants, it was found that Gulai Masam, a traditional Malay dish from North Sumatra, utilizes a variety of food ingredients that reflect a high level of biodiversity. The main ingredients of this dish generally come from animal sources, while the spices and seasonings are derived from plant-based materials. In total, 33 species of food ingredients are commonly used in the preparation of Gulai Masam, consisting of 12 animal species and 21 plant species. The detailed composition of these ingredients is presented in Table 1 below.

Table 1 shows that the main ingredients in the Malay *Gulai Masam* dish in North Sumatra are dominated by animal-based protein sources, particularly from various species of fish. There are 12 species of main ingredients classified as animal-based, 11 of which come from different family of freshwater and marine fish, and one from a domesticated poultry species, namely chicken (*Gallus gallus domesticus*). The species of fish used reflect a broad utilization of aquatic resources, ranging from marine species such as patin (*Arius thalassinus*), kembung fish (*Rastrelliger kanagurta*), and senangin fish (*Eleutheronema tetradactylum*), to freshwater species like Nila fish (*Oreochromis niloticus*) and jurung fish (*Neolissochilus thienemanni*).

Most of the fish are used whole (entire body), indicating efficient use of ingredients and contributing to the dish's rich flavor. Some species of fish and chicken are also used in specific parts considered to deliver the best taste, such as fish heads or chicken thighs and chest. The diversity of fish used reflects the close connection of the Malay community in North Sumatra with their surrounding aquatic environment, as well as their local knowledge in selecting appropriate ingredients to create the distinctive taste of *Gulai Masam*.

Table 1. Species of Main Ingredients and Spice Ingredients in Gulai Masam.

No	Family	Species of Food Ingredients		Part used
		Scientific name	Local name	
A. The main ingredient				
1	Ariidae	*Arius thalassinus*	Mayung	Head and all part
2	Carangidae	*Selaroides leptolepis*	Selar	All part
3	Cichlidae	*Oreochromis niloticus*	Nila	All part
4	Cyprinidae	*Neolissochilus thienemanni*	Jurung	All part
5	Pangasidae	*Pangasius hypophtalmus*	Patin	Head and all part
6	Phasianidae	*Gallus gallus domesticus*	Chicken	Thighs and chest
7	Plotosidae	*Plotosus lineatus*	Sembilang	All part
8	Scombridae	*Rastrelliger kanagurta*	Kembung	All part
9	Bagridae	*Bagrus nemurus*	Baung	Head and all part
10	Polynemidae	*Eleutheronema tetradactylum*	Senangin	All part
11	Serranidae	*Epinephelus malabaricus*	Grouper	All part
12	Spratelloididae	*Spratelloides gracilis*	Tamban	All part
B. Herb and Spices				
1	Amaryllidaceae	*Allium cepa* L.	Shallot	Tuber
		Allium sativum L.	Garlic	Tuber
2	Apiaceae	*Coriandrum sativum* L.	Cariander	Seed
3	Aracaceae	*Cocos nucifera* L.	Coconut	Endocarp
4	Clusiaceae	*Garcinia atroviridis* Griff. ex T. Anderson	Asam gelugur	Fruit
5	Euphorbiaceae	*Aleurites moluccanus* (L.) Willd.	Candlenut	Seed
6	Lamiaceae	*Ocimum basilicum* L.	Basil	Leaf
7	Myristacaceae	*Syzygium polyanthum* Miq.	Salam	Leaf
8	Oxalidaceae	*Averrhoa bilimbi* L.	Starfruit	Fruit
9	Piperaceae	*Piper nigrum* L.	Pepper	Seed
10	Poaceae	*Cymbopogon citratus* (DC.) Stapf	Lemongrass	Stem
11	Polygonaceae	*Persicaria odorata* (Lour.) Sojak	Cendohom	Leaf
12	Rutaceae	*Citrus aurantifolia* (Christm.) Swingle	Lime	Fruit
		Citrus hystrix H. Perrier	Kaffiir lime	Leaf
13	Solanaceae	*Capsicum annuum* L.	Red chili	Fruit
		Capsicum frutescens L.	Cayenne pepper	Fruit
		Solanum lycopersicum Lam.	Tomato	Fruit
14	Zingiberaceae	*Zingiber officinale* Roscoe	Ginger	Rhizomes
		Etlingera elatior (Jack) R.M.Sm.	Torch ginger	Rhizomes
		Curcuma longa L.	Turmeric	Rhizomes
		Alpinia galanga (L.) Willd.	Galangal	Rhizomes

In addition to animal-based ingredients, *Gulai Masam* also incorporates a variety of plant-based ingredients as spices and seasonings. According to Table 1, there are 21 plant species from 14 different family used in the dish. These spices and herbs serve not only to enhance flavor and aroma, but also have functional values as natural preservatives and as flavor balancers, contributing to the sour, spicy, and savory profile that characterizes this dish. The plants used come from various parts of the plant, including leaves, stems, rhizomes, seeds, and fruits. Commonly used ingredients include *Allium cepa* (shallot), *Capsicum frutescens* (bird's eye chili), *Curcuma longa* (turmeric), and *Zingiber officinale* (ginger), which provide the signature taste and color of the dish. Additionally, ingredients such as *Averrhoa bilimbi* (starfruit), *Citrus hystrix* (kaffir lime leaves), *Etlingera elatior* (torch ginger), and *Garcinia atroviridis* (asam gelugur) enhance the aroma and contribute to the dish's complex sour flavor.

The combination of various spices and herbs reflects the community's deep local knowledge in blending plant-based ingredients to create the unique flavor profile of *Gulai Masam*. The use of diverse plant species that are readily available in the surrounding environment also illustrates the strong connection between local wisdom and the sustainability of natural resources

Fig. 1. Food Ingredient in Making Malay Gulai Masam Dish.

Figure 1 visually presents the food ingredients used in the preparation of Gulai Masam, characterized by a yellow to reddish color resulting from the use of natural spices such as turmeric, chili, and shallots. The thick and oily texture of the broth reflects the richness of the spices and the cooking process.

The diversity of ingredients in *Gulai Masam* lies not only in the species and parts used, but also in their sources, which illustrate the community's close connection with the local environment and ecosystems. Based on interviews and observations, the sources of the ingredients are categorized into three main groups : markets, cultivation, and the wild.

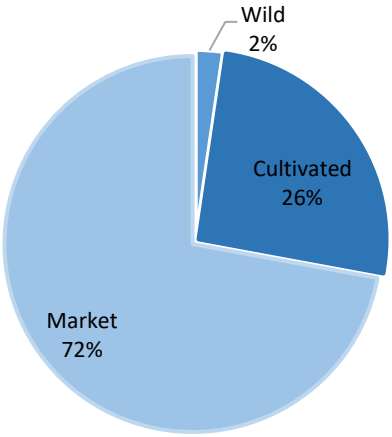

Fig. 2. Sources of Ingredients for Gulai Masam

Figure 2 shows that the majority of food ingredients used in the Malay Gulai Masam dish are sourced from markets, accounting for 72%. This indicates a high dependence on commercial distribution systems to meet culinary needs, both for household consumption and culinary businesses. Meanwhile, approximately 26% of the ingredients are obtained through home or local cultivation, reflecting the continued presence of household or community-based agricultural practices as alternative sources that support food security. Only 2% of ingredients come from the wild, indicating that direct exploitation of wild natural resources is relatively low, possibly due to limited access, availability, or conservation efforts. This composition suggests that although Gulai Masam ingredients reflect local biodiversity, their current supply heavily relies on market access.

3.2 The cultural value of gulai masam in malay society

The interviews with key informants revealed that *Gulai Masam* holds an important role in the lives of the Malay community in North Sumatra. This dish is not only consumed as part of daily meals, but it also reflects a local knowledge system closely tied to the conservation and management of natural resources. From an ethnobiological perspective, *Gulai Masam* can be seen as an example of the relationship between humans and their biological environment through culinary traditions.

The preparation process of *Gulai Masam* illustrates the link between culture and local biodiversity. Informants stated that the selection of ingredients is based on inherited knowledge, including understanding of the plant and animal species used, the specific parts of each organism utilized, and the appropriate methods and timing for processing. This knowledge reflects the presence of Traditional Ecological Knowledge (TEK), which continues to thrive within the community [11].

The preparation of *Gulai Masam* often occurs in collective settings such as feasts and traditional ceremonies, serving as a means for learning and knowledge transmission. For example, the community knows that *Etlingera elatior* (torch ginger) should be harvested

before the flower fully blooms to retain its optimal aroma and flavonoid content, or that dried *Garcinia atroviridis* (gelugur/tamarind slice) produces a stronger, longer-lasting sour flavor as a natural seasoning [12].

The cultural values embedded in this dish have a positive impact on the preservation of local food sources. Natural ingredients are carefully maintained and traditionally cultivated, and are not replaced by modern or synthetic alternatives. Therefore, the practice of preparing *Gulai Masam* can be regarded as a form of community-based conservation that helps safeguard biodiversity [13].

From an ethnobiological standpoint, *Gulai Masam* is significant not only socially, but also ecologically and conservationally. This tradition demonstrates how culture, environment, and scientific knowledge can interact, offering a foundation for strengthening biodiversity conservation strategies rooted in local community practices.

3.3 Contribution to local food security

Gulai Masam is a traditional Malay dish from North Sumatra that plays a significant role in supporting local food security. This dish makes use of various biological resources in a diverse, adaptive, and sustainable manner. In the context of biology, food security is not only related to the availability of calories but also encompasses the diversity of food sources, the utilization of local resources, and the preservation of food species that are ecologically and socially compatible with local communities.

Based on interviews with key informants, *Gulai Masam* is described as a tangible example of food diversification based on biodiversity. A total of 33 food ingredients were identified, derived from 26 family of plants and animals. This diversity is seen as a crucial strategy in building a resilient food system capable of withstanding changes in seasons, ecosystems, and climate. According to experienced cooks, the variety of ingredients not only enriches the flavor profile but also ensures the year-round availability of raw materials.

Nutritionally, *Gulai Masam* contains carbohydrates from seeds and tubers, protein from freshwater fish such as *Bagrus nemurus*, and bioactive compounds like flavonoids from *Etlingera elatior* and essential oils from *Curcuma longa* rhizomes [14]. This composition makes *Gulai Masam* an example of a local food that is not only nutritionally balanced but also aesthetically valued.

Informants also explained that most ingredients are sourced through a combination of household cultivation and sustainable wild harvesting. For instance, turmeric is usually grown in home gardens, while *Garcinia atroviridis* fruit and river fish are collected during the harvesting season. This pattern reflects the everyday practice of agro-biodiversity conservation. Communities actively act not only as users but also as stewards of local germplasm, preserving it both *in situ* (in its natural habitat) and *ex situ* (outside its original habitat) [15]. This knowledge and ethical approach to nature have been passed down through generations, especially by elders, as part of the community's ecological worldview.

The presence of *Gulai Masam* in daily life and traditional ceremonies signifies its function beyond mere sustenance. According to cultural leaders, the dish reflects cultural identity and strengthens social bonds within the community. Moreover, the use of local ingredients helps reduce dependence on imported foods and reinforces a food system that aligns with the local environmental context.

Therefore, the interviews indicate that *Gulai Masam* is not only a cultural heritage but also a model of a biodiversity-based food system that supports genetic preservation, community self-reliance, and ecosystem sustainability. This approach is crucial to consider in the development of food security policies grounded in local wisdom

4 Conclusion

The Malay Gulai Masam of North Sumatra is a tangible representation of the integration between local biodiversity and traditional knowledge in culinary practices. Utilizing 33 species of food ingredients derived from both plants and animals, sourced through markets, cultivation, and the wild, this dish reflects an adaptive and sustainable food system. The cultural, social, and ecological values embedded in *Gulai Masam* highlight its significance not only as a daily staple but also as a means of preserving traditional ecological knowledge and community identity. Therefore, *Gulai Masam* deserves to be recognized as a model of local cuisine that supports food security, genetic resource conservation, and the empowerment of community self-reliance grounded in local wisdom.

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