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Tanggo-Tanggo: An Ethnobiological Study of a Traditional Batak Toba Food for Biodiversity Learning through Educational Videos

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ABSTRACT

Traditional foods are part of indigenous knowledge or local wisdom that reflects cultural identity, natural potential, and the social values of local communities. However, knowledge related to traditional foods is often transmitted orally from generation to generation and has not been well documented scientifically, particularly regarding the use of local biodiversity. Tanggo-tanggo is a traditional Batak food that represents the close relationship between culture and local biodiversity. This study aims to examine Tanggo-tanggo from an ethnobiological perspective and develop local culture-based learning media for formal education in schools, integrating it with community-based informal learning to support cultural conservation. The research was conducted using an ethnobiological approach, and data were collected through interviews with seven informants using snowball sampling and participatory observation. The process of making Tanggo-tanggo involves 16 species, comprising 15 plant species and 1 animal species, namely pigs (Sus scrofa domesticus), with plant parts used including rhizomes, fruits, flowers, tubers, and leaves. The processing techniques are simple and have been passed down from generation to generation as part of Batak community traditions. The results show that Tanggo-tanggo not only functions as a dish but also as an expression of cultural identity and rich local knowledge. This research is expected to contribute to ethnobiological documentation, support local culture-based education, and promote food security, natural resource conservation, and community empowerment.

INTRODUCTION

Indonesia is recognized as a megadiverse country with extraordinary biodiversity, which is closely intertwined with the cultural traditions and local wisdom or indigenous knowledge of its communities (Widiatmaka, 2022). Biodiversity encompasses all forms of life and their interactions, including genetic diversity, species, and ecosystems, ranging from plants, animals, and fungi to microorganisms, and from various habitats such as forests, deserts, wetlands, rivers, seas, and agricultural systems (Tsioumani &

Tsioumanis, 2020). Biodiversity plays a vital role in maintaining the balance of nature and meeting human needs, as well as serving as a bulwark against environmental damage and natural disasters (Heydari et al., 2020).

Biodiversity is closely related to indigenous knowledge or local wisdom. Local wisdom can be understood as the distinctive identity of an area that is reflected in traditions, such as culinary practices based on local natural ingredients, customs that preserve ecosystems, dance and music inspired by biodiversity, and various traditional ceremonies that respect the natural cycle, thereby supporting the preservation of biodiversity in a sustainable manner (Rummar, 2022). Therefore, local wisdom, which has begun to erode under modernization and globalization, needs to be preserved and used as a learning resource that connects traditions with modern paradigms (Satino et al., 2024).

Indigenous knowledge is related to ethnobiology. Ethnobiology is a field of biological study that scientifically examines and evaluates people's knowledge of living things and their environments, including plants, animals, and natural ecosystems (Helida, 2021). Ethnobiology has developed into a field particularly concerned with integrating knowledge in complex multi-stakeholder situations and emphasizing the practical relevance of local communities' biological knowledge to address socio-ecological challenges (Ludwig & El-Hani, 2020). Indigenous knowledge, as studied ethnographically, is traditional food.

Traditional food reflects a unique and diverse local culture, with distinctive flavours that define certain people. This food is developed based on natural potential and local wisdom, reflecting the cultural richness and diversity of each region (Swandayani et al., 2023). Indonesia's geographical and cultural diversity also gives rise to a variety of traditional foods typical of each region, reflecting the interaction among the environment, food availability, and people's consumption patterns (Wachyuni, 2024).

Traditional food is also found in the Batak Toba community, which has a rich culinary cultural heritage inherited from generation to generation through daily life experiences (Nurhasanah, 2024). One example is *tanggo-tanggo*, a typical Batak Toba dish made from pork and cooked with local spices, such as andaliman and basil leaves, which reflect the unique natural ingredients of the Lake Toba ecosystem. The selection of *tanggo-tanggo* in this study was based on the peculiarities of its unique ingredients, integrating ethnobiological elements such as the use of endemic spices that are rarely found outside the Batak region, as well as the scarcity of in-depth studies on them, even though traditional

Batak foods have been the focus of studies by several researchers before.

Research by Alfiyami (2023) and Marpaung et al. (2025) examines Arsik carp from a cultural perspective and emphasizes the importance of the younger generation's involvement in preserving Batak culinary traditions. Furthermore, Cristy et al. (2024) explain that *dekke arsik, dekke natinombur, dekke naniura, manuk napinadar, lapet,* and *saksang* are dishes served during traditional environmental ceremonies, whereas *itak gurgur, mie gomak,* and *sasagun* are more commonly consumed in everyday life. Research by Ulfa et al. (2019) focused on fermented foods and found that BAL bacteria are fluorescent, beneficial, and resistant to the antibiotics amoxicillin and cefotaxime.

Furthermore, the research conducted by Simanullang et al. (2022) provides information about typical Batak snacks, namely *lappet.* Although they make important contributions, these studies are still limited to aspects of food use, symbolic value, and microbiological potential. In fact, integrating local wisdom and biological knowledge has the potential to enrich understanding of biodiversity while supporting efforts to conserve nature (Adinugraha et al., 2021).

Research on traditional foods such as *tanggo-tanggo* from an ethnobiological perspective remains limited. Such an approach can reveal the relationships between humans and biological resources used in food preparation, including local knowledge of ingredients, processing techniques, and associated cultural values, which are important for cultural preservation and biodiversity conservation.

Biology learning itself is still not contextually relevant to daily life, so the knowledge gained is difficult to apply (Pratiwi et al., 2019). In the digital age, learning videos can be an effective interactive medium to enhance students' learning experience (Utomo, 2023). Therefore, biodiversity education needs to adapt to globalisation by providing learning resources that are relevant, interesting, and accessible to the wider community, rather than being limited to formal education (Pratiwi et al., 2019).

Efforts to preserve biodiversity are crucial to addressing existing environmental threats. Local wisdom can serve as a source of inspiration for innovative biology learning, helping students develop scientific literacy, character, and awareness as conservation agents. The development of local wisdom–based learning resources can be carried out through research and development models tailored to the characteristics of the product (Alimah, 2019). In the digital era, innovative and interactive learning media are also needed to enhance learning effectiveness and

encourage students' active participation (Utomo, 2023).

Studies integrating biodiversity aspects of traditional *tanggo-tanggo* food through video-based learning media remain limited. Therefore, this study aims to document the ethnobiological aspects of *tanggo-tanggo* of the Batak Toba, including the biological materials used, processing techniques, and cultural meanings, as well as to develop learning videos for biodiversity topics in high school. This approach is expected to help students understand biodiversity while recognizing their role in preserving natural and cultural resources. Moreover, documenting *tanggo-tanggo* is important because the local knowledge associated with it is at risk of disappearing. Hence, it needs to be documented through an ethnobiological approach to preserve cultural heritage (Sunariyati et al., 2018).

This study is relevant to the curriculum as it can serve as a contextual learning resource for biodiversity topics. Integrating biology and culture through an ethnobiological perspective may also enhance science literacy while fostering appreciation for cultural heritage and environmental awareness (Putra & Wahyuni, 2025). This research also presents innovations in learning media through educational videos that align with the characteristics of the digital generation, making the learning process more fun, interactive, and effective.

RESEARCH METHODS

Study Design

The research method uses field studies or field exploration. Field exploration was carried out using interviews, observations and documentation. This research uses ethnobiology principles. Ethnobiology is now developing as a holistic study that examines the integration between biological, social, and ecological aspects in the reciprocal relationship between humans and their environment (Iskandar, 2016). The research procedure is illustrated in **Figure 1**.

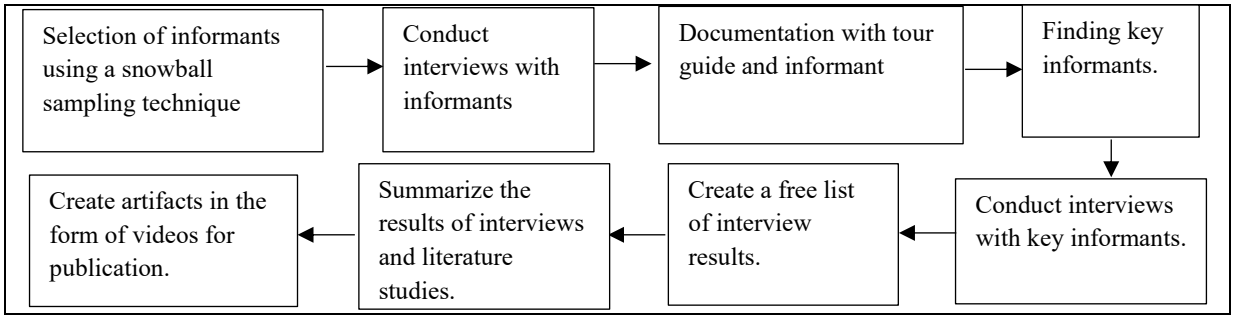

Figure 1. Research procedure (Adinugraha, 2024)

Procedure

The field exploration procedure in this study began with the selection of informants using snowball sampling, in which recommendations are obtained by asking one informant to suggest another relevant informant (Scott, 2008). After the informant is selected, the researcher conducts an initial interview to dig up basic information.

Data Collection

The data collected included the plants and animals used, tools, the preparation process, and documentation for the *tanggo-tanggo* educational video. The informants consisted of four key informants (aged over 30 years and having more than 5–10 years of experience in preparing and selling *tanggo-tanggo*) and three general informants (aged 30–50 years and of Batak Toba origin). This exploratory study was conducted for three months (August–October 2025) in North Jakarta, as shown in **Figure 2.**

Interviews are conducted to obtain information through question and answer interactions (Arismunandar, 2013). Informants were selected using the snowball sampling technique (Scott, 2008). Observations were carried out during the preparation of *tanggo-tanggo* in the *lapo*, and documentation in the form of photos and videos was collected for making of the educational video.

Data Analyze

The collected data were analyzed qualitatively through three stages: data reduction, data presentation, and conclusion drawing. Information from observations, interviews, and documentation was filtered and categorized into themes such as tools, materials, and the *tanggo-tanggo* preparation process. The results were then presented in descriptive narratives, tables, and visuals to illustrate the ethnobiological aspects of *tanggo-tanggo.*

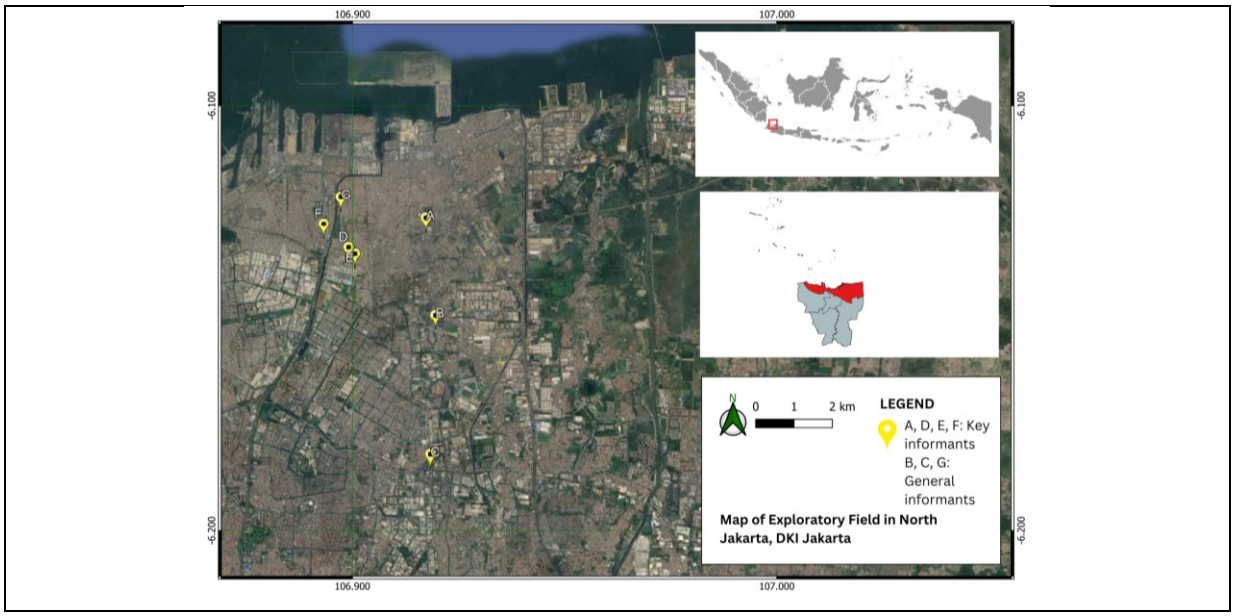

Figure 2. Field exploratory location

RESULTS AND DISCUSSION

Plants and Animals Used in *Tanggo-Tanggo*

Tanggo-tanggo is a typical Batak culinary heritage from North Sumatra made from pork. According to informants B, F, and G, the name "*tanggo-tanggo*" comes from the word "satanggo," which means one piece, and the characteristic of this food is a large, cube-shaped piece of meat. Moreover, local spices such as andaliman (*Zanthoxylum acanthopodium* DC.) and rias (*Etlingera elatior* (Jack) R.M.Sm) are used to enrich the dish's flavour. In its manufacture, *tanggo-tanggo* uses plants and animals. The animal used is a pig. Pig (*Sus domesticus* Erxleben*).* It has a rather rough black body, a long snout, a curved back, and a body posture that does not touch the ground on the abdomen when standing (Heryani et al., 2023). Pigs have a flexible, strong snout, equipped with cartilage and powerful muscles that allow them to dig into the ground in search of food with great sensitivity (Sridianti, 2024). The structure of the pig's body is presented in **Figure 3.**

Plants are also used in the preparation of *tanggo-tanggo*. Various plant species function as spices that contribute to the distinctive flavor and aroma of the dish. The use of these plant ingredients reflects the community's knowledge of local biological resources and their culinary functions. In addition to spices, bambu (bamboo shoots) are also commonly used as one of the main ingredients in the preparation of *tanggo-tanggo*. Based on interviews conducted with informants A-G, several species of plants and animals were identified as ingredients used in the preparation of *tanggo-tanggo*. The list of these species is presented in **Table 1**.

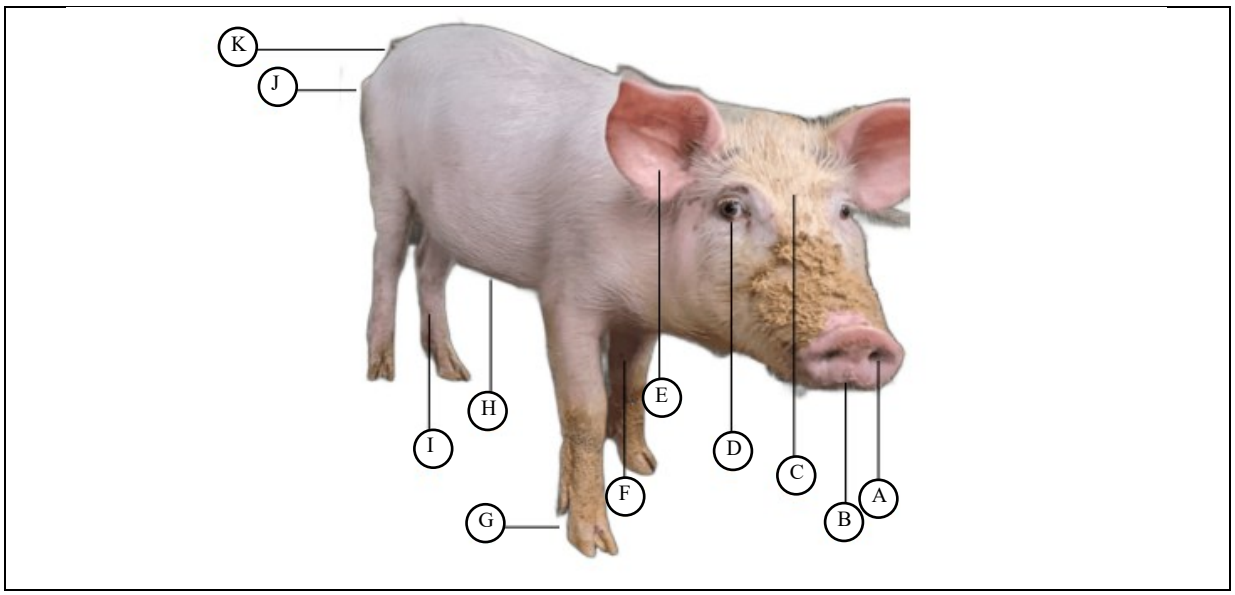

Figure 3. Body Structure of Pigs (*Sus domesticus*). A. Muzzle/nose; B. Mouth; C. Head (anterior); D. Eyes; E. Earlobes; F. Front legs; G. Nails; H. Stomach (abdomen); I. Hind legs; J. Anus (posterior); K. Tail.

Table 1. Species used for the making of *tanggo-tanggo*

No	Local Name (Batak/ Indonesian)	Species	Genus	Family	Order	Clade/ Class	Parts Used
Plants							
1	*Hunik (Kunyit)*	*Curcuma longa* L.	*Curcuma*	Zingiberaceae	Zingiberales	Monocots	Rhizome
2	*Laos (Lengkuas)*	*Alpinia galanga* (L.) Willd.	*Alpinia*	Zingiberaceae	Zingiberales	Monocots	Rhizome
3	*Sangge-sangge (Serai)*	*Cymbopogon citratus* (DC.) Stapf	*Cymbopogon*	Poaceae	Poales	Monocots	Rod
4	*Pege (Jahe)*	*Zingiber officinale* Roscoe	*Zingiber*	Zingiberaceae	Zingiberales	Monocots	Rhizome
5	*Gambiri (Kemiri)*	*Aleuritas moluccanus* (L.) Willd	*Aleurites*	Euphorbiaceae	Malpighiales	Eudicots	Fruit
6	*Sabe (Cabai Merah)*	*Capsicum annuum* L.	*Capsicum*	Solanaceae	Solanales	Eudicots	Fruit
7	*Sabe (Cabai Rawit)*	*Capsicum frutescens* L.	*Capsicum*	Solanaceae	Solanales	Eudicots	Fruit
8	*Bawang Merah*	*Allium cepa* L.	*Allium*	Amaryllidaceae	Asparagales	Monocots	Tubers
9	*Bawang Putih*	*Allium sativum* L.	*Allium*	Amaryllidaceae	Asparagales	Monocots	Tubers
10	*Andaliman*	*Zanthoxylum acanthopodium* DC.	*Zanthoxylum*	Rutaceae	Sapindales	Eudicots	Fruit
11	*Asom Galugur (Asam Gelugur)*	*Garcinia atroviridis* Griff. ex T. Anderson	*Garcinia*	Clusiaceae	Malpighiales	Eudicots	Fruit
12	*Jeruk purut*	*Citrus hystrix* DC.	*Citrus*	Rutaceae	Sapindales	Eudicots	Leaves
13	*Tubis (Rebung Bambu)*	*Bambusoideae*	*Bambusa*	Poaceae	Poales	Monocots	Buds
14	*Lokio (bawang batak)*	*Allium chinense* G. Don	*Allium*	Amaryllidaceae	Asparagales	Monocots	Tubers
15	*Rias (Kecombrang)*	*Etlingera elatior* (Jack) R.M.Sm	*Etlingera*	Zingiberaceae	Zingiberales	Monocots	Flowers
Animal							
16	*Pinahan (Babi)*	*Sus domesticus* Erxleben	*Sus*	Suidae	Artiodactyla	Mammals	Legs/ body

Note: Clade is used for grouping in plants, while class is used for animals.

All informants stated that the ingredients for *tanggo-tanggo* are easy to obtain from the surrounding environment, such as markets, mobile traders, or home gardens, indicating that they are accessible and affordable. The preparation process also allows students to learn the benefits of the plants used, such as andaliman, a typical North Sumatran plant known for its spicy taste and citrus aroma, often referred to as “Batak pepper” (Silalahi & Lumbantobing, 2021). The plant species used are presented in **Figure 4**.

Figure 4. Plant species used in *tanggo-tanggo*. A. *Hunik (Kunyit)*; B. *Laos (Lengkuas)*; C. *Sangge-sangge (Serai)*; D. *Pege (Jahe)*; E. *Gambiri (Kemiri)*; F. *Sabe (Cabai Merah)*; G. *Sabe (Cabai Rawit)*; H. *Bawang Merah*; I. *Bawang Putih*; J. *Andaliman*; K. *Asam Galugur*; L. *Daun Jeruk*; M. *Tubis (Rebung Bambu)*; N. *Lokio (Bawang Batak)*; O. *Rias (Kecombrang)*

In the making of *tanggo-tanggo*, 15 species of plants are used from seven families of plants, namely Zingiberaceae, Poaceae, Euphorbiaceae, Solanaceae, Amaryllidaceae, Rutaceae, and Clusiaceae. The plant parts used include rhizomes (Zingiberaceae), flowers (Zingiberaceae), fruits (Euphorbiaceae, Solanaceae, Rutaceae, and Clusiaceae), tubers (Amaryllidaceae), and leaves (Rutaceae). Based on clade classification, the species consist of monocots (Zingiberaceae, Poaceae, and Amaryllidaceae) and eudicots (Euphorbiaceae, Solanaceae, Rutaceae, Clusiaceae, Myrtaceae).

The diversity of plant ingredients gives *tanggo-tanggo* its distinctive taste and appetizing aroma. The Batak community in Jakarta continues to appreciate the variety of food plants used in this traditional dish, allowing *tanggo-tanggo* to remain popular and authentically preserved. The presence of these plant species reflects the region's natural richness and culinary culture, highlighting the importance of preserving valuable traditional food heritage. The distribution of plant families is presented in **Figure 5**.

Utensils Used in Making *Tanggo-Tanggo*

The utensils used in making tanggo-tanggo are relatively diverse, although most are common household cooking utensils. Informants A–G reported using a gas stove for cooking tanggo-tanggo. Blenders are also commonly used to grind the spices. The utensils used in the preparation of tanggo-tanggo are presented in **Table 2** and **Figure 6**.

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Table 2. Utensils used in making *tanggo-tanggo*

No	Utensils	Explanation
1	*Balanga (Kuali/Wajan)*	Metal cookware is heated on a stove for processing food.
2	*Kompor gas*	Gas-fueled cookware, such as LPG
3	*Piso (Pisau)*	Tools for cutting, slicing, and chopping foodstuffs.
4	*Spatula*	Tools for stirring, retrieving, or moving food.
5	*Blender*	A tool for mashing and mixing foodstuffs (spices).
6	*Baskom*	Containers for holding or mixing foodstuffs
7	*Ulekan*	Tools for pureeing ingredients such as onions and spices
8	*Talenan*	Tools for cutting, slicing, and mashing foodstuffs such as vegetables, meat, and fruits

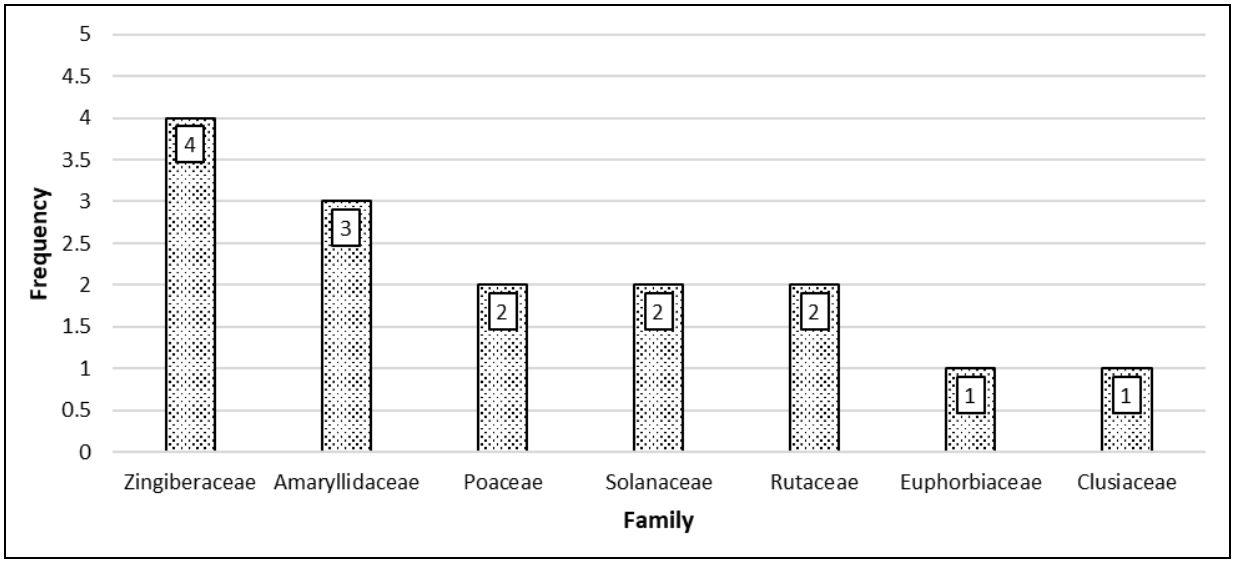

Figure 5. Family groups used in *tanggo-tanggo*

Figure 6. Utensils used in making *tanggo-tanggo*. A. *Balanga* (Kuali/Wajan); B. Kompor gas; C. *Piso* (Pisau); D. Spatula; E. Blender; F. Baskom; G. Ulekan; H. Talenan.

Figure 7. The process of making *tanggo*-tanggo. A. The process of selecting the meat to be used; B. The process of selecting the spices to be used; C. Spices in the form of chili, turmeric, galangal, lemongrass, ginger, onion, garlic that have been mashed; D. The process of cooking spices until cooked; E. Cooking *tanggo-tanggo* until cooked; F. *Tanggo-tanggo* that are ready to be served.

Informant E said that *tanggo tanggo*, which in the Batak language means "satanggo" or "sepotong", is a traditional Batak Toba dish. Unlike *saksang,* which is cut into small pieces, *tanggo-tanggo*, in large pieces, resembles dice. *Tanggo-tanggo* is a dish passed down from generation to generation. According to informant C, the use of local spices such as andaliman, rias, and asam galugur in its manufacture can add its own flavour to *tango-tanggo*.

***Tanggo-Tanggo* Making Process**

The preparation of tanggo-tanggo involves three main stages: preparation, cooking, and serving. The process begins with preparing the necessary tools and ingredients, including selecting and cutting beef—typically from the leg or back—into large pieces and cleaning it thoroughly. Various local spices such as red chili, cayenne pepper, shallots, garlic, turmeric, galangal, lemongrass, ginger, andaliman, and candlenut are ground, while supporting ingredients like bamboo shoots, rias leaves, galugur acid, and lokio onions are prepared as needed. The use of locally available ingredients reflects the community's adaptation to surrounding biodiversity and supports local food systems (Nasution et al., 2025).

At the cooking stage, the informant explained that the spices are sautéed before the meat and other ingredients are added and cooked for about 40–50 minutes until tender. The informant emphasized that kecombrang (torch ginger flower) and galugur acid are important not only for flavor but also as part of traditional culinary knowledge passed down through generations. Tanggo-tanggo is commonly served for family meals and is also sold in Lapo restaurants, as illustrated in **Figure 6.**

Tanggo-Tanggo Educational Videos

The *tanggo-tanggo* educational video has been uploaded to YouTube (https://youtu.be/3RFjAIA2-BA). This 7-minute video was designed to introduce *tanggo-tanggo* and its ethnobiological aspects. The learning video showcases the richness of Batak culture through traditional pork dishes prepared with local spices. The video opens with a focus on the importance of Indonesia's biodiversity, which must be maintained and preserved. This learning video illustrates, using an ethnobiological approach, how the process of making Tanggo-tanggo demonstrates that it is not only a culinary heritage but also a symbol of indigenous knowledge passed down from generation to generation.

The limitations of this study are the lack of effective biology education videos and the lack of integration of local wisdom into learning, so it is necessary to design a learning experience that integrates educational videos featuring local wisdom to improve understanding of biodiversity. The local and cultural wisdom approach is a biology teaching approach that combines ethnobiological studies and learning principles to integrate science knowledge and local culture (Adinugraha et al., 2021). Therefore, integrating local wisdom or indigenous knowledge about the role of species in traditional foods can increase students' awareness of the value of biodiversity, which is an important first step in preventing biodiversity loss (Marpaung et al., 2025).

CONCLUSION

Biodiversity plays an important role in shaping traditional foods within local communities, where ingredients from the surrounding environment are utilized and processed based on local knowledge passed down through generations. These foods often reflect regional characteristics, cultural values, and the natural potential of an area. *Tanggo-tanggo* is a traditional Batak culinary heritage that integrates local biodiversity with strong cultural values. The preparation of *tanggo-tanggo* involves 16 species, consisting of 15 plant species and 1 animal species, namely pig (*Sus domesticus*). The plant parts used include rhizomes, fruits, flowers, tubers, and leaves. The cooking techniques are relatively simple and have been inherited across generations within the Batak community. Beyond functioning as a dish, *tanggo-tanggo* represents an expression of Batak cultural identity. Documenting this knowledge is important for preserving ethnobiological heritage and supporting contextual education based on local culture. Therefore, *tanggo-tanggo* can be recognized as a local culinary model that contributes to food security, natural resource conservation, and

community empowerment grounded in indigenous knowledge or local wisdom.

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