

From tradition to education: documenting and promoting Tboli indigenous cuisine for culinary learning

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ABSTRACT

The rich indigenous food systems of the Tboli people in South Cotabato, Philippines, are at risk due to modern dietary shifts and the influence of fast-food culture. This study aimed to document traditional Tboli dishes covering ingredients, preparation methods, nutritional content, and cultural significance using the gastronomic systems research (GSR) framework. A mixed-method approach was employed involving 219 respondents, including elders, cookery students, and personnel from the National Commission on Indigenous Peoples (NCIP) and tourism office. Data were gathered through interviews, focus group discussions, and an elicitation workshop. Nutritional values were computed using the Department of Science and Technology's Food and Nutrition Research Institute (DOST-FNRI) Philippine Food Composition Table (PhilFCT). The findings revealed that the Tboli indigenous food system is characterized as predominantly root crops (*ubi koyu*, *kleb*, *ubi*, *ubi koyu ndek*, and *lubed*), vegetables (*hokū*), chicken meat (*onuk nelut*, *onuk heklafak*, and *onuk snóbów*), fish (*bunog* or *paitan*), crabs (*kléngé snóbów*), and frogs (*fak snóbów*) prepared through healthy methods like boiling, steaming, and grilling. A recipe book developed from the findings received a high acceptability rating (mean score: 4.84) based on content, format, organization, and accuracy. The study supports the preservation of Tboli food heritage and highlights its potential integration into the senior high school cookery curriculum as a contextualized learning material.

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1. INTRODUCTION

The global debate on sustainable food systems has increasingly focused on the critical need to address the unsustainable use of natural resources in production and consumption. In 2021, the United Nations Food Systems Summit highlighted the challenges posed by global hunger, food insecurity, climate change, and biodiversity loss. The summit underscores a call to action for transformative solutions that can nourish the people and sustain the planet. Among these solutions, indigenous food systems have gained global attention among scientists [1]–[4] for their potential to support good human nutrition as well as maintain a balance with nature [5], [6].

Indigenous food systems have existed for centuries, and they encompass a wide range of practices, from the cultivation of minor and endemic crops to the preservation of unprocessed, locally sourced foods, culturally accepted, including the sociocultural meanings, processing techniques, and nutritional consequences [2], [7], [8]. However, these invaluable food systems are often under threat from industrialization, globalization, and the erosion of traditional knowledge. This is particularly true for indigenous community of Tboli in Southwestern Mindanao, whose rich indigenous food system is at risk of being lost due to modern dietary shifts and the rise of fast-food culture.

The Tboli are one of the 87 tribal groups in the Philippines, making up 15% of the population [9]. They are known to be hunters, gatherers, and agriculturalists using slash and burn techniques to farm, and this practice reflects their deep relationship with their environment, distinct cultural identity, and unique gastronomic system. However, the lack of comprehensive documentation on Tboli indigenous gastronomic food system poses a significant challenge to preserving this cultural heritage.

This study advances two significant novelties in the field. First, it systematically applies the gastronomic systems research (GSR) framework [10] to elicit traditional ingredients, preparation methods, nutritional components, and cultural significance of traditional Tboli dishes. In the GSR framework, gastronomy is taken as an appreciation and understanding of the many avenues of cooking and food production, including food quality, foodways, and culinary anthropology [11]. Second, and central to practical impact, is the development of a rigorously crafted contextualized learning material, a recipe book, specifically tailored for educational integration and cultural transmission.

The present research seeks to address the following questions: i) what are the traditional dishes, ingredients, and preparation practices unique to the Tboli people? ii) what are the nutritional profiles and cultural meanings of these dishes within the Tboli food system? and iii) to what extent is the developed Tboli recipe book valid and acceptable as a contextualized learning resource for public school cookery instruction, as evaluated by expert validators and cookery teachers in terms of content, format, organization, accuracy, and usability? By addressing these questions, the study contributes to the dual goals of documenting at-risk intangible heritage and producing a validated, high-quality educational resource for both present and future generations. This ensures broader recognition, appreciation, and sustainable preservation of Tboli culinary heritage in both academic and practical domains.

2. METHOD

2.1. Research design

This study used a mixed-method design in which a descriptive quantitative approach was used to identify the Tboli dishes most frequently served during breakfast, lunch, dinner, and special occasions and the nutritional component of the dishes. Moreover, qualitative methods were used to elicit the ingredients, cooking methods, and cultural significance of traditional Tboli dishes. Additionally, an immersion method was employed, where researchers observed pure-blooded Tboli chefs as they prepared various traditional dishes, providing detailed insights into the ingredients, cooking methods, and cultural significance of the cuisine.

2.2. Research instrument validation and reliability testing

The primary data collection instrument in this study was a researcher-made questionnaire, which consisted of two main sections. The first section gathered demographic data of respondents, specifically age, sex, and address. The second section focused on documenting consumption patterns, ingredient choices, and cooking methods relevant to Tboli dishes.

An expert validation process was conducted, engaging a panel comprising a representative from the National Commission on Indigenous Peoples (NCIP), a licensed professional teacher with expertise in instrument validation, and an officer from the Tourism Office. Items were evaluated for content relevance and alignment with the documentation objectives using a four-point content validity index (CVI) scale, as adapted from Elangovan and Sundaravel [12]. The panel assessed a total of 18 items, and analysis in Microsoft Excel yielded a universal CVI of 1.00, demonstrating full expert agreement on item adequacy [13]. Instrument reliability was ascertained through a pilot test involving ten elder Tboli participants. Internal consistency analysis using Cronbach's Alpha yielded a coefficient of 0.75, indicating an acceptable reliability.

2.3. Contextualization of the GSR framework

The 219 respondents from the municipality of Tboli participated in the elicitation workshop. Purposive sampling was employed to select individuals who possessed cultural knowledge or institutional involvement relevant to the indigenous food systems of the Tboli community. The participants included personnel from the NCIP, licensed professional teachers with expertise in instrument validation, personnel

from the tourism office, and pure-blooded Tboli elders aged 49 and above from Barangays Lemsnonon, Salacafe, and Laconon. In addition, grade 11 TVL cookery students enrolled at Tboli National High School for the academic year 2023-2024 were included to represent the younger generation's perspective on food knowledge and practices. The respondents were tasked with contextualizing the GSR framework [10] by providing information on the traditional Tboli dishes typically eaten and served during breakfast, lunch, dinner, and special occasions, as well as their ingredients and cooking methods.

2.4. Nutritional analysis by computation

Nutritional components were calculated using the Philippine Food Composition Table (PhilFCT) [14] for calories (kcal), carbohydrates (g), protein (g), lipids (g), calcium (mg), phosphorus (mg), iron (mg), vitamin A (retinol activity equivalent or RAE), thiamin (mg), riboflavin (mg), niacin (mg of niacin equivalent or NE), and vitamin C (mg). The final computations were formally reviewed and validated by a licensed nutritionist-dietitian to ensure alignment with standard nutritional assessment protocols. The computations were based on a single representative recipe per dish, using ingredient proportions and known nutrient values from the PhilFCT. To ensure the accuracy of the computed nutrient values, all results were formally reviewed and validated by a licensed nutritionist-dietitian, ensuring compliance with standard nutrition assessment protocols.

2.5. Analysis of data

Frequency counts were used to summarize the Tboli dishes reported by respondents for each meal (breakfast, lunch, dinner, and special occasions), as well as their corresponding ingredients and cooking methods, based on the 219 participants' check-all-that-apply responses. Nutritional components were computed using the Department of Science and Technology's Food and Nutrition Research Institute (DOST-FNRI) PhilFCT [14].

2.6. Crafting and evaluation of recipe book

A recipe book was developed and crafted based on the results of survey and interview, and focused group elicitation. The recipe book covers a brief history of the dish, ingredients, procedure, picture-plated product, and a set of study questions and references. The recipe book was evaluated using the evaluation rating sheet for print resources by the Learning Resources Management and Development System of the Department of Education. Recipe book evaluators were experts of Tboli, head of tourism office, who has in-depth knowledge of Tboli culture, and public high school teachers with a professional license and expertise in the field, a subject area supervisor, or a curriculum specialist with at least five years of relevant experience in the learning area. The recipe book's rating sheet comprises four factors: content, format, presentation and organization, and accuracy and up-to-dateness of information. If the recipe book fails in at least one of the four factors of the evaluation rating, then it will not be recommended for possible use.

3. RESULTS AND DISCUSSION

Gastronomy can be defined as the art of selecting, preparing, serving, and enjoying fine food [15]–[17]. The Filipinos have a general rule of three meals in a day: breakfast (*almusal*), lunch (*tanghalian*), and dinner (*hapunan*). With the emergence of fast-food chains and the changing lifestyles of the younger generation, there is a risk of losing traditional Tboli dishes due to the lack of comprehensive documentation of indigenous knowledge. In this study, we apply the GSR framework to explore and document the traditional dishes of the Tboli people.

3.1. A morning feast: traditional Tboli breakfast

As shown in Figure 1, the respondents identified *ubi koyu* (cassava root) Figure 1(a), *kleb mlikan* (taro root) Figure 1(b), *soging* (banana *saba*) Figure 1(c), and *ubi* (sweet potato) Figure 1(d), and as the most popular breakfast foods, with the highest frequency of consumption (69), followed by *onuk nelut* or grilled native chicken in bamboo (63) and *onuk hekklafak* or grilled native chicken (42). Tboli people rely on a wide variety of root crops, a vital alternative source of carbohydrates for the community when rice is scarce. The traditional boiling technique employed to cook the root crops emphasized the simple way of living of the Tboli people.

The Tboli morning meal is distinguished by a preference for consuming root crops, often paired with native coffee, which holds significant cultural significance. These findings are supported by Gayao *et al.* [18], who reported that indigenous peoples of Northern Philippines have historically considered roots and tubers essential foods. Within indigenous communities, roots and tubers serve not only as staples

for household consumption but also as items for trade, medicine, and ceremonial gifts. The cultivation of root and tuber crops is seen to instill values of hard work and self-sufficiency in the community.

Ubi koyu, *kleb mlikan*, *ubi*, and *soging* are rich primarily in carbohydrates, providing 42.8% of the total weight. The protein content is relatively low at 1.2%, whereas lipids account for 0.2%, leading to a total caloric value of 177.8 kcal per serving. These foods also contain essential micronutrients, including 35 mg of calcium, 44 mg of phosphorus, and 0.9 mg of iron per serving. Additionally, they contain vitamins such as vitamin A (29 IU), vitamin C (23 mg), thiamine (0.07 mg), riboflavin (0.03 mg), and niacin (1 mg NE), making them valuable sources of nutrition for communities that rely on them as dietary staples [14].

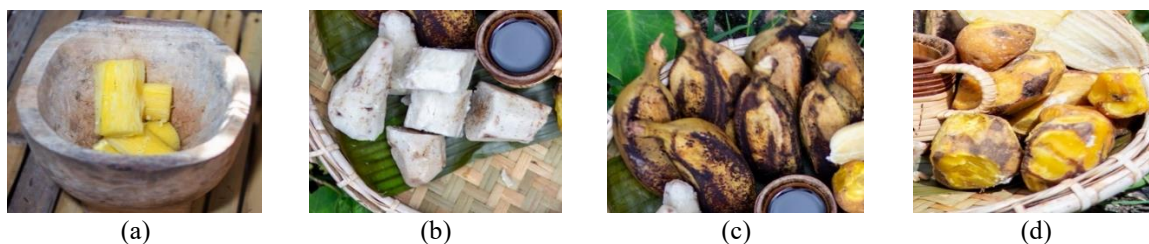


Figure 1. Traditional Tboli breakfast dishes featuring root crops and fruits: (a) *ubi koyu*, (b) *kleb mlikan*, (c) *soging*, and (d) *ubi*

3.2. Midday delights: flavors of Tboli lunch cuisine

Figure 2 showcases signature Tboli lunch dishes prepared in bamboo tubes, highlighting the unique traditional cooking method essential to midday meals. For lunch, *onuk nelut* is rated the most frequently served dish (86), followed by boiled root crops such as *ubi koyu*, *kleb mlikan*, *ubi*, *soging* (69) and *onuk heklafak* (62). *Onuk nelut* is cooked by putting *onuk* (native chicken) slices in *kling* (bamboo stem), as in Figure 2(a) along with other ingredients, such as *kahi* (salt), *mala tonok* (ginger), *ksuna* (onion), *ketai* (lemongrass), and *bawing* (basil). Banana leaves were used to seal the bamboo stem, and which then was grilled for one hour in burning charcoal. The use of bamboo for cooking, especially during ancient times when pots were not readily available, highlights the indigenous community's innovative approach to culinary practices. In addition, the Tboli people also used bamboo to cook their rice as shown in Figure 2(b), like the culinary tradition in Southeast Asian countries [19]. *Onuk nelut* is particularly notable for its high protein content, which makes up 17.4% of its composition. Lipids at 16.2%, providing a substantial 145.8 kcal. Carbohydrates are minimal, accounting for just 0.2% leading to a total caloric value of 216.2 kcal. *Onuk nelut* is a good source of essential micronutrients, offering 77 mg of calcium, 153 mg of phosphorus, and 1.6 mg of iron per serving [14].



Figure 2. Signature Tboli lunch dishes prepared in bamboo tubes: (a) *onuk nelut*: grilled native chicken traditionally cooked in bamboo, imparting a smoky, earthy flavor and (b) *ken nelut*: bamboo-cooked rice, a staple accompaniment to grilled meats during midday meals

3.3. Evening indulgence: Tboli dinner specialties

For dinner, *onuk heklafak* presented the highest frequency rating (84), followed by *onuk nelut* (62), and boiled root crops such as *ubi koyu*, *kleb mlikan*, *ubi*, and *soging* (41). The traditional preparation of *onuk heklafak* as in Figure 3 involves roasting or grilling the native chicken, seasoning it with native spring onion and basil for an aromatic and tender finish. *Onuk heklafak* is usually paired with *tifas* (native coconut wine) during dinner. This dish serves as a reward for the Tboli people's hard work on the farm and helps keep them

warm in the highland's cold temperatures. Historically, *onuk hekklafak* was a convenient food during the *kaingin* system (slash-and-burn clearing of forests before planting) because it is easy to prepare and does not require complex kitchen utensils.

The dish contains 17.4% protein and 16.2% lipids, accounting for 145.8 kcal. Carbohydrates at just 0.1%, giving the dish a total caloric value of 215.8 kcal. *Onuk hekklafak* is rich in essential minerals and vitamins, including 76 mg of calcium, 152 mg of phosphorus, and 1.6 mg of iron. Additionally, it provides significant amounts of vitamin A (162 IU), vitamin C (4 mg), thiamine (0.07 mg), riboflavin (0.1 mg), and niacin (9.9 mg NE) [14].



Figure 3. *Onuk hekklafak*

3.4. Festive flavors: Tboli culinary delights for special occasions

Onuk nelut emerged as the most frequently (85) served dish during special gatherings, such as thanksgiving celebrations, tribal marriages, birthdays, and tourist visits, followed by *onuk hekklafak* (42) and various boiled root crops, including *ubi koyu*, *kleb mlikan*, *ubi*, and *soging* (18). These dishes highlight the Tboli people's strong agricultural roots and their deep connection to their environment. *Onuk nelut* is a valuable source of protein in the Tboli diet. The preference for such dishes is comparable to the findings of Cuevas *et al.* [10], who reported that the consumption of *lechón* or roasted chicken, often regarded as a status symbol, is prevalent during significant events. This suggests that much like other indigenous groups do, Tboli culinary practices are deeply rooted in their social and cultural identities.

3.5. Tboli traditional dishes

Figure 4 illustrates various traditional Tboli dishes that highlight the community's rich use of indigenous ingredients. The preparation of *kléngé snóbów* (freshwater crab soup) reflects the Tboli people's deep connection to their environment and traditional practices as in Figure 4(a). This dish primarily utilizes *kléngé* (crabs) captured from the highlands of Tboli, South Cotabato in Mindanao, Philippines. *Kléngé* belongs to a group of species morphologically like *Sundathelphusa philippina* [20] and the recently discovered *Sundathelphusa roberti* from the highlands of Batangas, Southern Luzon, Philippines. *Kléngé* and *Sundathelphusa roberti* have the same ecology (both species thrive in less disturbed and more pristine mountainous areas). The morphology is characterized by a mostly brown overall color but has darker brown spots and orange and pale-yellow coloring [21].

The preparation involves washing fresh *kléngé*, boiling it with water, salt, lemongrass, basil, and ginger, and then serving the dish hot. The traditional method of catching *kléngé* usually uses locally available materials such as corn cob excess and abaca fiber to create bait, which is strategically placed by the river at 5:00 pm. Traditionally, the Tboli people believe that *kléngé snóbów* and any food-sourced rivers have healing properties. This suggests a deep relationship between the local ecosystem and the health and well-being of the Tboli community. The dish contains 7.8% protein, 2.2% lipids, and 4.9% carbohydrates. Notably, *kléngé snóbów* is exceptionally rich in calcium, providing 1191 mg per serving, which is crucial for bone health. The dish also contains 119 mg of phosphorus, 0.6 mg of iron, and 203 IU of vitamin A [14].

Fak snóbów (frog soup) as in Figure 4(b) represents a unique aspect of the Tboli culinary tradition, emphasizing both the skill involved in capturing *fak* (frog) and the cultural significance attached to its preparation. The process of catching *Fak* is accurately timed, occurring between 7:00 PM and dawn when the frogs are asleep, demonstrating the Tboli people's intimate understanding of the frogs' behavior. Additionally, Tboli believe that revealing the location of frog hunting could bring bad luck and cause the frogs to hide adds a layer of magic to the practice, strengthening the deep-rooted traditions and superstitions that shape Tboli food culture. The preparation of *fak snóbów* involves simple ingredients: frog meat, ginger, salt, and water. The dish contains 3% protein, 0.1% carbohydrates and 0.1% lipids. It provides small amounts of essential minerals, including 7 mg of calcium, 24 mg of phosphorus, and 0.3 mg of iron [14].

Bnalun (grilled fish wrapped in leaves, symbolizing trust) as in Figure 4(c) refers to a cooking technique that involves wrapping fish, typically *bunog* or *paitan*, along with salt, onion, and basil in layers of *méngé* and banana leaves, and then grilling the bundle over a medium fire. In Tboli culture, it is believed that only the person who wraps the dish should unwrap it. This belief underscores the significance with which the Tboli people approach their cultural norms, as opening another person's *bnalun* can be seen as a betrayal, a symbolic act with significant social repercussions. Thus, *bnalun* not only highlights Tboli's ability to utilize local ingredients and traditional cooking methods but also serves as a powerful symbol of trust and cultural fidelity within the community. *Bnalun* is a nutrient-dense with 18.1% protein content and 3.8% lipids. This dish is rich in calcium (195 mg) and phosphorus (420 mg), which are essential for bone health, and provides 1.5 mg of iron, supporting red blood cell function [14].

Figure 5 presents Tboli cassava-based desserts that emphasize the versatility of cassava in creating culturally significant sweet dishes for everyday consumption and special occasions. *Ndek* is a traditional Tboli cooking process that involves crushing all ingredients together in one pot, a method that is central to the preparation of *ubi koyu ndek* (mashed cassava sweetened with brown sugar, soft and ideal for children as well as elders) as in Figure 5(a). This dessert, made from cassava root, is valued for its suitability for toddlers, children, and elderly individuals, who may have difficulty consuming hard food. The preparation of *ubi koyu ndek* involves boiling and crushing cassava and gradually adding brown sugar. Similarly, *lubed* (steamed grated cassava wrapped in banana leaves, served during special occasions) as in Figure 5(b), another popular Tboli carbohydrate-rich dessert often prepared during special occasions, underscores the versatility of cassava. The process involves grating cassava, sweetening it with brown sugar, and steaming it in banana leaves. *Lubed* is often prepared during special occasions. The use of traditional tools, such as a tin can with holes (referred to as "*Asà*") for grating and bamboo for handles, highlights the resourcefulness and sustainable practices of the Tboli people.

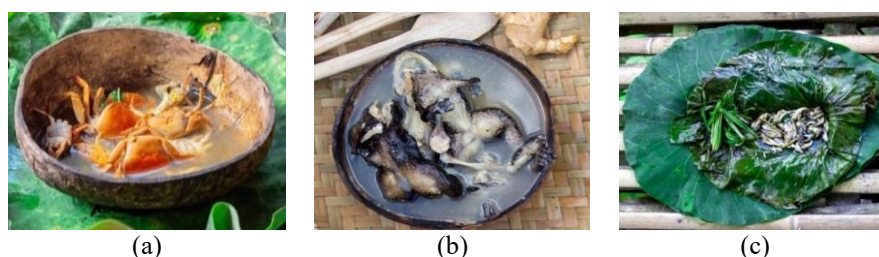


Figure 4. Traditional Tboli dishes showcasing indigenous ingredients and cultural practices: (a) *kléngé snóbów*, (b) *fak snóbów*, and (c) *bnalun*



Figure 5. Tboli cassava-based desserts: (a) *ubi koyu ndek* and (b) *lubed*

Figure 6 highlights nutritious and culturally significant Tboli dishes. The presence of *hokù* or fiddlehead fern along the riversides and lakes in the mountainous regions of Tboli Municipality offers a glimpse into the area's rich biodiversity. This abundance is particularly notable given the region's landlocked nature, with numerous lakes and rivers, including the renowned Lake Holon, contributing to a unique and thriving ecosystem.

Rich in fibers and vitamins, *hokù hentu* (fiddlehead salad) as in Figure 6(a) serves as both a culinary delicacy and a vital source of nutrients, reflecting the Tboli people's reliance on local, sustainable food sources to meet their nutritional needs. Other traditional salads, such as *tubed ubi* (sweet potato bud), *tubed basuk* (squash bud), and *tubed blangol* (string bean bud), further illustrate the diversity of edible plants in the locality. The consumption of locally available, nutrient-rich plants provides a profound understanding of the

environment and the importance of consuming diverse plant-based foods for overall well-being. *Hoku hentu* contains 2.6% carbohydrates, 0.8% protein, and 0.2% lipids. *Hoku hentu* supplies essential micronutrients, including 12 mg of calcium, 15 mg of phosphorus, and 0.5 mg of iron, which are crucial for bone health and oxygen transport in the blood [14]. *Onuk snóbów* or native chicken soup as in Figure 6(b) is a distinctive variation of native chicken *tinola* that is enhanced with native herbs and seasonings. A unique aspect of *onuk snóbów* is the traditional process of drying out the chicken in a pan to extract its natural oils, which add a rich aroma and depth of flavor, balancing the sweet and savory notes that characterize this dish.

Onuk snóbów is particularly recommended for lactating women or those who have recently given birth, adding another layer of significance to the dish. The ingredients used are believed to be nourishing and beneficial for postpartum recovery, providing essential nutrients that help replenish strength and support the well-being of new mothers. *Onuk snóbów* has 17.5% protein and 16.2% lipids providing 221.8 kcal per serving. *Onuk snóbów* is rich in essential minerals, including 84 mg of calcium, 156 mg of phosphorus, and 1.8 mg of iron, which are vital for bone health and blood function [14]. Tboli believed that the abstinence of oil in their food makes their lifestyle a healthy living. Tboli diet is quite similar to Mediterranean diets, which generally have minimal processed food and are rich in fruits, legumes, and vegetables, with little meat and more fish [22].

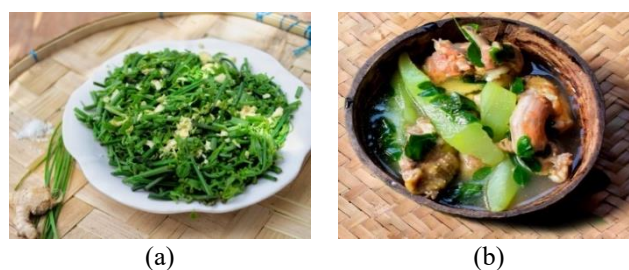


Figure 6. Nutritious and culturally significant Tboli dishes: (a) *hokù hentu* and (b) *onuk snóbów*

3.6. The herbs and spices used in the Tboli dishes

Spices and herbs not only improve the taste of food but are also excellent sources of vitamins, minerals, and antioxidants. Indonesian cuisine, for example, uses fresh herbs and spices such as onion and garlic, spring onion, ginger roots, turmeric, and galangal [23]. Similarly, Tboli cuisine consists of a variety of spices and herbs as in Figure 7, such as *ksuna*, *ksuna kufil* (spring onion, native), *mala tonok*, and *bawing*, which are the commonly used herbs and spices, and *kahí*, which season in the Tboli dishes.

The flavor of ginger stems mainly from gingerols and shogaols, which provide notable spiciness and warmth, and the balance between these compounds is essential for the desired taste and quality in cooking [24]–[26]. In Filipino cuisine, ginger is commonly utilized in chicken soup (*tinolang manok*) [27], and marinades, enhancing the overall flavor of these dishes with its distinctive aroma contributed by the essential oils in ginger rhizomes [28]. In Tboli cuisine, *ketai* in Figure 7(a) and *mala tonok* in Figure 7(b) are staple ingredients in dishes such as *onuk nelut*, *fak snóbów*, and *kléngé snóbów*. However, it is important to balance ginger with other spices to prevent its strong taste from overwhelming the more delicate flavors in some dishes.

Ksuna (*Allium cepa* L.) hold great cultural and historical importance and are renowned for their flavor, nutrition, and traditional medicinal uses [29], [30]. In Filipino cuisine, onions play a vital role as traditional culinary staples, adding depth and richness to various dishes. The aromatic and flavorful onion bulb is widely utilized, contributing to the unique flavor profile of Filipino culinary creations [31]. *Ksuna* in Figure 7(c) is a staple ingredient in many Tboli cuisines, such as *onuk snóbów*, *onuk nelut*, and *bnalun*. *Kahí* in Figure 7(d) is an essential seasoning and universal ingredient in Tboli cuisine, fundamental to flavoring a wide range of traditional dishes including *onuk snóbów*, *onuk nelut*, *ken hnunges*, and many others.

Ocimum basilicum L. (commonly known as sweet basil) is an herb known for its rich culinary history and traditional medicinal applications. Sweet basil is widely utilized in multiple forms, including fresh, dried, and paste, particularly in Mediterranean dishes like pesto. In Vietnamese cuisine, basil plays a key role in increasing the flavor of dishes such as *pho*, demonstrating its importance across different cultures and regions [32], [33]. In Tboli cuisine, *bawing* in Figure 7(e) is a staple ingredient in dishes such as *onuk*

snóbów, *onuk heklafak*, *onuk nelut*, *bnalun*, *unge snóbów* (rice field rat soup), *abu* (abalong soup), and *sdo talunan* (wild pig soup).

Spring onions are perennial herbaceous vegetable crops of the genus *Allium* [34]. *Ksuna kufil* and *Allium fistulosum* (scallions) are known to have mild onion-like flavors, unlike bulb-forming *Allium* species (such as common onion and garlic), which are nonbulb-producing. However, *ksuna kufil* is distinct from *Allium fistulosum* because of its flat and slender green stalks, as opposed to the tubular or hollow nature of the latter. Spring onion is a staple ingredient in salads, stir-fries, garnishes, and a myriad of culinary preparations [34], [35]. In Malaysia and Singapore, they use Spring onions as garnish in *lor mee*, also known as gravy noodles [33]. *Ksuna kufil* in Figure 7(f) is a staple ingredient in Tboli dishes such as *onuk heklafak*, *unge snóbów*, *abu*, and *sdo talunan*.

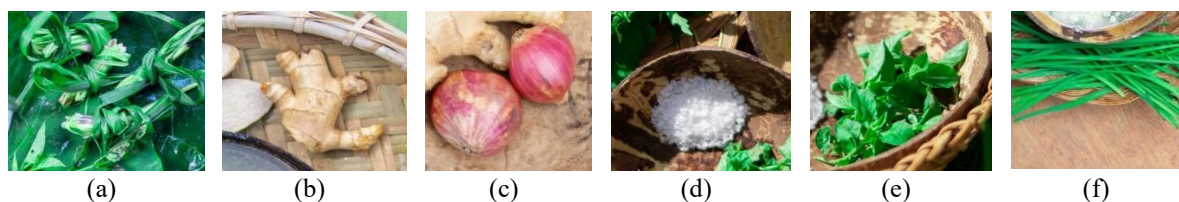


Figure 7. Herbs and spices of Tboli cuisine: (a) *ketai*, (b) *mala tonok*, (c) *ksuna*, (d) *kahi*, (e) *bawing*, and (f) *ksuna kufil*

3.7. Result of recipe book validation by experts of Tboli

Table 1 shows the four factors used in evaluating the recipe book, namely: content, format, presentation and organization, and accuracy and up-to-dateness. Further, the result gathered from the validators obtained a mean average of 26.8, 58.2, 19.2, and 24 respectively. The recipe book is highly recommended for possible use in public schools.

Table 1. Evaluation rating result for print resources

Factors	Resource score	Mean	Remarks
Content	21/28	26.8	Passed
Format	49/64	58.2	Passed
Presentation and organization	15/20	19.2	Passed
Accuracy and up-to-dateness	24/24	24	Passed

3.8. Result on acceptability of recipe book among cookery teachers

As indicated in Table 2, the computed weighted average for acceptability of recipe book is 4.84 with descriptive equivalent of excellent and regarded as acceptable as contextualized learning material in teaching cookery subject.

Table 2. Result on acceptability of recipe book

Indicators	Mean	Verbal interpretation
1 Recipe book is organized in a binder, pocket and other bound notebook	5.00	Acceptable
2 Recipe book is divided into easily understood questions with recipes filed appropriately	4.97	Acceptable
3 All recipes are printed neatly or word processed in appropriate recipe format.	4.73	Acceptable
4 Recipes can easily be understood because it has English and Tboli translation	4.80	Acceptable
5 The product is cost-effective and can contribute to students' learning	4.75	Acceptable
6 Recipe book is relevant and acceptable to my teaching career	5.00	Acceptable
7 I am satisfied with the quality of the recipe book	4.65	Acceptable
8 I will use this cookbook in teaching Cookery	5.00	Acceptable
9 I will refer this recipe book to other colleagues	4.70	Acceptable
Overall mean	4.84	Acceptable

4. CONCLUSION

This study documented 11 major traditional dishes through interviews, focus group discussions, and community immersions, providing valuable insights into Tboli culinary heritage. The recipe book developed from this research reflects these dishes and has been validated for its content, format, presentation and

organization, and accuracy and up-to-dateness, with respective expert scores of 26.8, 58.2, 19.2, and 24. It achieved a weighted average of 4.84, signifying an excellent degree of acceptability for use in teaching the cookery subject in senior high school (SHS).

The recipe book aligns with the Department of Education's (DepEd) mandate on contextualization, indigenization, and localization as stipulated in DepEd Order No. 5, s. 2016. This order encourages making student learning more meaningful and relevant by connecting content to learners' real-life experiences and cultural contexts. By featuring Tboli dishes prepared using native ingredients and methods, the recipe book supports the contextualized curriculum of the SHS Cookery strand under the technology and livelihood education (TLE) track. It bridges indigenous knowledge and formal education, making it highly relevant for learners in the Tboli municipality and other communities with similar cultural food traditions.

Moreover, the recipe book may serve as a valuable teaching and learning resource that promotes cultural pride, sustainable food practices, and nutrition education among students. It also has potential use in tourism and culinary training, showcasing the Tboli food system as an asset in both education and cultural preservation. Future studies are encouraged to conduct chemical-based nutritional analyses to validate the computed nutrient content of Tboli dishes. Additionally, exploring the sensory acceptability of these indigenous foods across different age groups and cultural backgrounds will provide deeper insights into their palatability and potential for wider adoption. Research may also investigate the integration of these traditional dishes into school-based feeding programs to promote nutrition and cultural education. Assessing the scalability of using indigenous food systems as contextualized learning tools in other indigenous peoples (IP) communities across the Philippines is likewise recommended. Finally, future work should explore the role of Tboli youth in preserving culinary heritage through participatory cooking activities that promote intergenerational transmission of traditional food knowledge.

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AUTHOR CONTRIBUTIONS STATEMENT

This journal uses the Contributor Roles Taxonomy (CRediT) to recognize individual author contributions, reduce authorship disputes, and facilitate collaboration.

Name of Author	C	M	So	Va	Fo	I	R	D	O	E	Vi	Su	P	Fu
Analyn A. Gellamucho	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	
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C : **C**onceptualization

M : **M**ethodology

So : **S**oftware

Va : **V**alidation

Fo : **F**ormal analysis

I : **I**nterpretation

R : **R**esources

D : **D**ata Curation

O : **O**riginal Draft

E : **E**diting

Vi : **V**isualization

Su : **S**upervision

P : **P**roject administration

Fu : **F**unding acquisition

CONFLICT OF INTEREST STATEMENT

The authors declare that there is no conflict of interests regarding the publication of the paper.

INFORMED CONSENT

We have obtained informed consent from all individuals included in this study.

ETHICAL APPROVAL

The study was conducted in collaboration with the Local Government Unit of the Municipality of Tboli, South Cotabato, Philippines (LGU-Tboli), the NCIP, and the Tboli Tourism Office. A series of consultations and discussions with tribal leaders and NCIP officers were conducted to orient the stakeholders toward the academic purpose of the research and ensure mutual agreement and respect. Approval was formalized through a resolution and certification signed by indigenous political structure (IPS) leaders in accordance with NCIP by-laws. All 219 respondents who participated in this survey provided written informed consent prior to the commencement of the study. The NCIP issued a certificate of validation confirming that the information contained in this research is factual and properly reflective of customs, traditions, beliefs and indigenous knowledge systems and practices (IKSPs).

DATA AVAILABILITY

The supplemental data for this article can be accessed online at <https://doi.org/10.17632/82bd5bvrf.1>.

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