
Nutritional content evaluation of traditional food recipes consumed by ethnic communities of Tai Dam in Loei, Thailand

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Abstract The results showed that the traditional food of the Tai Dam ethnicity had a unique identity. There were 30 recipes divided into six categories: curry, grilled food, spicy salad, Homok, chili paste, and dessert. There were 4-5 recipes in 1 deck (a set menu of food put on a big container like a tray), with sticky rice as the primary food. Eighty percent of the food ingredients were local herb and vegetable sources, and the other 20 percent comprised meat, fish, chickens, eggs, insects, and small animals. Distinctive features of curry dishes include a variety of herbs. Nutritional content analysis resulted in recipes with the highest energy and nutrients in 3 or more aspects in each category; "Sua Pla Duk" or Catfish Spicy Curry with the energy of 166.17 kcal, 10.53 g fat, and 12.01 g protein. "Oh Pla" provides the energy of 136.11 kcal, 3.68 g fat, and 18.73 g protein, and "Ua Dok Mak-Uk" provided 6.68 grams of carbohydrates, 38.11 RAE, vitamin A, 13.14 milligrams of vitamin C, and 0.72 grams of dietary fibres. The findings revealed that the Tai Dam recipe had a high overall nutritional content, suitable for eating as an immune-boosting drug for a healthy life, preventing emerging diseases, and the environmental community should preserve to obtain high-value food.

Keywords: Traditional food recipes, Nutritional content, Tai Dam ethnic, Loei province

Introduction

Food is a necessity of life. Searching for more healthy food is necessary in an era of emerging diseases. The food of ethnic groups differs according to the local environment and biological resource factors, including selected wisdom that is good for life and health. Tai Dam or Tai Song Dam is a group with unique food identities. There used to be a settlement in Sipsong Chutai District, in the Red River Basin, and Black River Basin in the city of Than or

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Dien Bien Phu in Vietnam. There is also an area adjacent to Phongsaly Province, Lao PDR. Some groups called themselves Lao Song; black clothes dyed from Hom and indigo trees are famous in their culture. They immigrated to Thailand during the Thonburi period (Department of Local Administration, 2022); they settled in 8 provinces in Thailand, namely Phetchaburi, Nakhon Pathom, Rachaburi, Chumphon, Prachuap Khiri Khan, Nakhon Sawan, Phichit, Pitsanulok, and Loei. Tai Dam ethnic group had a strong sense of conservation and inheritance of their culture by building the Tai Dam Community Cultural Center for collecting language, art, culture, and ways of life, such as costumes, building tall stilt wooden houses with tortoiseshell style roofs, holding traditions, preparing Tai Dam food. (Sirinthorn Anthropology Center, 2022).

When there was the outbreak of COVID-19, the demand for safe and healthy food for locals and tourists was increasing. Tai Dam Ban Na Pa Nard, Chiang Khan District, Loei Province, was the only Tai Dam cultural community in the Northeast. Settlers in 1882 still maintained their unique culture, traditions, beliefs, languages, foods, and costumes that harmoniously integrated the way of life in tourism activities (Phaisoon, 2022). It is a community in which tourists are interested, especially in the culture of Tai Dam food, which is distinctive in both food names and strange flavors, such as “Jub Pak” (Vegetable Spicy Salad), “Jaw Ta Dang” (Chili Paste Dip), and “Jub Bai Ma Muang” (Mango Leaf Spicy Salad). Ingredients used for cooking came from the fertile community from the fields, water resources, and forests. Therefore, it was healthy food. Most healthy people had an average life expectancy of 70 years or more. Therefore, food was a factor in preventing disease and promoting the health of the Tai Dam people and was an example of a group of people with medicinal recipes (Termsaithong and Chaitokkia, 2016). The research aimed to explore local vegetables used for cooking, collecting and categorizing types of recipes consumed regularly including evaluating the nutritional value of local food of the Tai Dam people.

Materials and methods

This one-year Participatory Action Research collaborated with Tai Dam Ethnic Community Centre, Chiang Khan District Agriculture Office, and Chiang Khan District Office in Loei, Thailand. The research site was at Tai Dam Ethnic Community: Moo 4 and Moo 12 Ban Na Pa Nad, Khao Kaew Sub-District, Chiang Khan District, Loei Province.

The samples were 30 critical informants of local food experts and housewives. The Multi-Method was applied to collecting data: (i) focus group discussion questions for the survey of local vegetables for cooking, (ii) in-depth

interviews for food set menus, ingredients, and cooking, (iii) record forms for recording materials and utensils used in cooking 6 food set-menus which were done by 6 groups of Tai Dam housewives (2-3 people per group), and (iv) INMUCAL-Nutrient V3 program for nutrition analysis.

Content analysis and INMUCAL-Nutrient V3 program for nutrition analysis were applied to calculate the nutrients and energy of the set menus differentiated into six categories; each set menu portion was enough for one person. This was compared to the suitability that Thai people's bodies should receive per day; that is, it was about 2,000 kilocalories of energy) Dietary Reference Intake: DRI (300 grams of carbohydrates, less than 65 grams of fat, and 50 grams of protein when eating one meal. Therefore, that 6 set-menus, in one set, should provide 666.67 kilocalories of energy, 100.00 grams of carbohydrate, 21.67 grams of fat, 21.67 grams of protein, 226.67 milligrams of calcium ARE, vitamin B1 equals 0.50 milligrams, vitamin C 20.00 milligrams, and dietary fibre 8.33 grams. Thus, the nutritional value of the food analyzed was at the standard, neither too high nor too low.

Results

Local vegetables used in the main dishes of Tai Dam

More than 69 local vegetables were used as ingredients for Tai Dam ethnicity's leading food, according to the survey. They could be categorized into 3 groups: 1) a group of 34 types of vegetables and fruit plants or fruits for savoy cooking, such as Pak-Gud (Vegetable fern), Pak-Narm (*Lasia spinosa*), Pak-Wan (Water clover), Bon (Elephant ear), Yaa Pak-Khwaai (Crowfoot grass), Yaa Pong, Pak-Tob (Common Water Hyacinth), mango leaves, Noe-Mai-Bung (a kind of bamboo shoot) Maak-Pak-Pum, Ma-Kea-Kean (Yellow Fruit Nightshade), Fak-Thong (Pumpkin), and Fak-Khiew (Chinese watermelon), etc. 2) a group of 15 types of vegetables and herbs used as ingredients for cooking, such as galangal, ginger, kaffir lime, lemongrass, leeks, mint, chili, onions, garlic, etc., and 3) a group of 20 kinds of vegetables and fruits for making deserts, eating as snacks, as well as for side dishes, such as jackfruit, mango, gooseberry, neem, banana, betel nut, sweet potato, corn, gooseberry, eggplant, etc.

In terms of using components of local vegetables for cooking, they were used differently according to the type of vegetable. Some of them used many of their components for cooking, such as Yaa Pak-Khwaai (Crowfoot grass) and mango leaves would be used both the whole leaves and young shoots.

However, some vegetables used only one component, such as Bon (elephant ear)-which used the leaf stalks, while Maak-Pak-Pum -used the fruits.

The top 10 most popular local vegetables used as main dishes in Tai Dam ethnic group’s cooking, Loei Province, were used differently to make various recipes as shown in Table 1 and Figure 1.

Table 1. The top 10 most popular local vegetables used as main dishes in Tai Dam ethnic group’s cooking

No.	Local vegetables	Edible parts	Tai Dam’s Menus
1	Pak-Wan	leaf, stem	Jub
2	Yaa Pong	leaf, stem	Jub
3	Bon	stem	Oom, Jaw-Od
4	Yaa Pak-Khwaai	leaf, leaf axil	Jub
5	Ma-Kea-Kean	Ripe fruit	Larb Ma-kea
6	Pak-Hud	leaf	Jub
7	Pak-Tob	leaf, stem	Jub
8	Mango leaves	leaf, leaf axil	Jub
9	Nor-Mai-Bung	sapling	Gaeng Nor-Bung
10	Maak-Pak-Pum	fruit	Jub



Figure 1. Local vegetables are used as the main dishes in Tai Dam ethnic group’s cooking. A) Food and Tai Dam Ethnic Identity B) Tai Dam Community’s local vegetables, and C) Set menus cooked from local vegetables

Types and traditional recipes of Tai Dam People

Tai Dam ethnicity’s traditional food has a unique identity inherited from the ancestors’ wisdom and is popular now -there are at least 30 recipes. More than 69 kinds of local vegetables are ingredients in the traditional Tai Dam dishes. Eating a meal uses a food deck arrangement method, and a family of 4-5 people has the food together. The sticky rice was the leading food. 80% of the food ingredients were local herbs and vegetables sourced, and another 20 % were meat, fish, chickens, eggs, insects, and small animals. There were many recipes per 1 deck which could be grouped into 6 types: Gaeng (curry), Ping-Yang (grilled), Yum (spicy salad), Nung (steamed), “Jaw” (dips and side

dishes), desserts and fruits. The sample group was divided into 5 small groups to cook traditional Tai Dam food for one person per meal by choosing 6 recipes in one deck from the traditional Tai Dam recipes from the past to the present.

Assessment of the nutritional value of traditional Tai Dam Food

The assessment of the nutritional value of 5 traditional Tai Dam dishes cooked by Tai Dam housewives was grouped into six types. Each type contained 1-5 recipes: 1) Gaeng(curry) such as “Gaeng Nor Mai Som Sai Kai” (Pickled-bamboo shoot with chicken curry), “Gaeng Hoitak Sai Pak- Ee-Hum” (Little Clams with Moringa Curry), 2) Ping, Yang -Grilled and roasted food such as grilled fish, “Ping Plara Yai” (Grilled big fermented fish), “Khanab Plasiw” (Grilled small fish mixed with ingredients wrapped in a piece of banana leaf), “Aua Dok Ma-uk” (Steamed pumpkin flower stuffed with ground pork mixed with ingredients) 3) Yum -A group of spicy salads, they were Jub Pak-wan (Pak-wan vegetable salad), Jub Pak-Ruam (all kinds of local vegetables mixed salad), Jub Moo Sai Bai Faad (Pork cooked with Faad leaves), Jub Bai Mamueang (Mango leaves salad), Jub Bai Pak-saang (Pak-saang vegetable salad), Larb Ma-Keua Lueang (Yellow Fruit Nightshade spicy salad), 4) Nueng-A group of steaming: Paam Khai (Steamed egg on a piece of banana leaf layer), steamed vegetables including seasonal fruits like pumpkin and zucchini, 5) Namprik-A group of dips: Jaw Ta Dang-Pak(Red chili paste together with vegetable), Jaw Ma-Uud Hom Dang – Pak (Chili paste together with vegetables), Jaw Od – Pak (Chili paste with vegetables), Jaw Kha - Pak (galangal chili paste with vegetables), and Jaw Pla Rae Fak-Pak (Chopped Rae fish with vegetables), 6) Khanom and Polamai (desserts and fruits): Khanom mok, boiled taro, sesame, Khaow Hua Ngork (Steamed sticky rice with shredded coconut), Tom Tua Kathi (Boiled peanuts with coconut milk), and seasonal fruits. The samples of Tai Dam’s recipes can be seen in Figure 2.

The overall analysis of each food type and the nutritional value evaluation of the food in each type were individually formulated as follows.

Gaeng (Curry). It is food that contains much water. The popular ingredients in a pot full of water were spices, crushed lemongrass, crushed onions, half broken peppers - some recipes used crushed ginger – no pounded chili paste. Most of them were clear and contained much water. Its taste was mild, not very spicy nor very salty, one can sip the soup. The curries were named differently depending on the ingredients used to prepare them. They were “Gaeng Nor Mai Som Sai Gai” (Pickled bamboo shoot with chicken), “Gaeng Hoitak Sai Pak- Ee-Hum” (Little Clams with Moringa Curry), “Gaeng Som Pak Khanjong Sai Gai” (Khanjong vegetable with sour chicken curry),

“Gaeng Mamii Sai Moo” (Jackfruit with pork curry), and “Sua Pla Duk” (Catfish spicy curry).



Figure 2. The samples of Tai Dam’s recipes are divided into 6 types: A) Gaeng (curry): Gaeng Som Pak Garnjong B) Ping, Yang (Grilled, Roast): Oh Pla C) Yum (Spicy Salad): Larb Makheua Lueang D) Nueng (Steam): Paam Khai E) Nam prik (Dip): Jaw-Od F) Khanom, Polamai (Dessert, Fruits): Kaow Hua-ngork and Ma-feung (star fruit)

Nutritional assessment results by using a ready-made computer program to calculate nutrients INMUCAL-Nutrients V3 (Institute of Nutrition Mahidol University, 2013) of curry for 1 person, 5 recipes indicated that most of them were low in fat, except for “Sua Pla Duk” (Catfish Spicy Curry). There were at least 2 recipes with the highest energy and nutrients: 1) “Sua Pla Duk” or Catfish Spicy Curry with an energy of 166.17 kcal, 10.53 g fat, and 12.01 g protein. 2) “Gaeng Hoitak Sai Pak- Ee-Hum” (Little Clams with Moringa Curry) provided vitamin A 85.49 RAE and vitamin C 39.09 mg. as shown in Table 2. In addition, it was found that the curry with the highest vitamin A was “Gaeng Hoitak Sai Pak- Ee-Hum” (Little Clams with Moringa Curry), followed by “Sua Pla Duk” (Catfish Spicy Curry) respectively. However, the curry with the highest energy was “Sua Pla Duk” (Catfish Spicy Curry). Many recipes of curry dishes were high in fibre, low in energy, and low in fat, such as “Gaeng Hoitak Sai Pak- Ee-Hum” (Little Clams with Moringa Curry), “Gaeng Nor Mai Som Sai Kai” (Pickled-bamboo shoot with chicken curry), “Gaeng Makmii” (Jackfruit curry), and “Gaeng Som Pak Garnjong Sai Gai” (Ganjong vegetable with chicken curry) respectively. On the other hand, the curry recipe with high protein was “Sua Pla Duk” (Catfish spicy curry), and the curry that provided a

high level of vitamin A was “Gaeng Hoitak Sai Pak- Ee-Hum” (Little Clams with Moringa Curry).

Table 2. Amount of energy and nutrients in curry recipes per 1 person

		Amount of energy and nutrients in curry recipes per 1 person							
No	Recipes	Energy (kcal)	Carbohydrates (grams)	Fat (grams)	Protein (grams)	Iron (mg)	Vitamin A (ARE)	Vitamin C (mg)	Dietary Fibre (grams)
1	“Gaeng Nor Mai Som Sai Kai”	44.64	2.1	1.07	6.08	0.8	3.53	1.44	0.1
2	“Gaeng Hoitak Sai Pak- Ee-Hum”	42.73	4.7	1.01	4.44	2.4	85.4	39.0	0.9
3	“Gaeng Som Pak Garnjong Sai Gai”	61.25	2.5	1.50	8.55	1.9	7.84	8.13	0.4
4	“Gaeng Makmii”	56.33	6.5	1.11	5.47	1.3	7.31	14.5	0.2
5	“Sua Pla Duk”	166.1	4.5	10.5	12.0	1.1	22.1	0	0.7
		7	9	3	1	5	0	7.15	5

Ping, Yang (Grilled, Roasted). The Tai Dam ethnic group does not like deep-fried or fried food, but they cook by grilling or grilling on a charcoal stove. “Ping” (Roast) can be done by wrapping *the food in banana leaves and roasting it, or without wrapping, the meat would be clamped with bamboo and roasted it.* To “Yang” (Grilled), food is placed on a rack above the charcoal grill. The most popular food for grilling comes from meat such as Pla (fish) “Pla Ping Tob”, “Oh Pla”, “Ping Plara Yai”, and “Kha-Nab Pla Siew”- except “Aua Dok Mak Uk” which the ingredients contain a vegetable “Dok Mak Uk (Pumpkin flower).

Nutritional assessment results by using a ready-made computer program to calculate nutrients INMUCAL-Nutrients V3 (Institute of Nutrition Mahidol University, 2013) of food for 1 person, 5 recipes of grilled food, “Pla Ping Tob”, “Oh Pla”, “Ping Plara Yai”, “Kha-Nab Pla Siew” and “Aua Dok Mak Uk”, showed that they were low in fat but high in protein. Two recipes with the highest energy and nutrients were 1) “Oh Pla” which provided 136.11kcal, 3.68 g fat, and 18.73g protein, and 2) “Aua Dok mak Uk” which provided 6.6 grams of carbohydrates, 38.11 grams of vitamin A, 13.14 milligrams of vitamin C, and 0.72 grams of dietary fibre as shown in Table 3. The recipe that provided the highest energy was “Oh Pla”, followed by “Pla Ping Tob”, and “Ping Plara Yai”, respectively. The food with the most elevated

protein was “Oh Pla”, followed by “Pla Ping Tob”. The recipe with the highest vitamins A and C was “Aua Dok Mak Uk”.

Table 3. The amount of energy and nutrients in grilled food recipes

		The amount of energy and nutrients in grilled food recipes per 1 person							
No.	Recipes	Energy (kcal)	Carbohydrates (grams)	Fat (grams)	Protein (grams)	Iron (mg)	Vitamin A (ARE)	Vitamin C (mg)	Dietary Fibre (grams)
1	“Pla Ping Tob”	109.22	4.42	1.95	16.90	1.65	31.61	2.13	0.40
2	“Oh Pla”	136.11	4.65	3.68	18.73	1.62	14.52	3.58	0.61
3	“Ping Plara Yai”	81.29	7.21	3.27	5.80	2.50	1.77	2.05	0.39
4	“Kha Nab Pla Siew”	49.49	1.22	2.30	6.00	2.09	2.23	0.98	0.17
5	“Aua Dok mak Uk”	51.25	6.68	1.45	3.16	1.91	38.11	13.14	0.72

Yum (Spicy Salad). The dialect language calls it “Jub” or “Larb”. Local vegetables were used as the main ingredients for this type of recipe. There were both recipes were cooked with steamed or boiled vegetables mashed together as well as mixed with the ingredients. The recipes were cooked with freshly chopped vegetables mixed well and flavored with spices such as onions, garlic, and chili, seasoned with salt and fermented fish, but no use of lemons because some vegetables are naturally sour, such as young mango leaves. A mild and salty flavor emphasized the taste. In addition, it was preferred to use vegetable leaves with an astringent taste, such as “Bai Faad” (Astringent leaves), “Pak wan” (Water clover), and “Pak Saang” (Local vegetable).

Nutritional assessment results by using a ready-made computer program to calculate nutrients INMUCAL-Nutrients V3 (Institute of Nutrition Mahidol University, 2013) of “Yum” (Spicy Salad) for 1 person, 6 recipes, namely “Jub Pak Wan”, “Jub Pak Ruam”, “Larb Ma Kheua Leung”, “Jub Moo Sai Bai Faad”, “Jub Bai Mamuang”, and “Jub Bai Sang”, showed that 3 recipes contained at least 2 types of the energy and nutrients at the highest level, consisted of 1) “Jub Moo Sai Bai Faad” (Pork with Bai Faad leaves Salad) provided 105.72 calories of energy, 8.97 grams of fat, 2) “Jub Bai Pak Sang” (Pak Sang Vegetable Salad) provided 9.50 grams of carbohydrates, 2.61 milligrams of iron, 3) “Jub Pak Wan” provided vitamin A 109.74 ARE and dietary fibre 2.09 grams as shown in Table 4. In addition, for nutritional value, it was founded that the recipe with the highest vitamin A and dietary fibre was “Jub Pak Wan”; the one with the highest vitamin C was “Larb Makhuea

Lueang”, followed by “Jub Pak Wan”. The recipe with the highest energy and fa content was “Jub Moo Sai Bai Faad” (Pork with Bai Faad leaves Salad).

Table 4. Energy and nutrient content in YUM recipes of Tai Dam ethnicities

		The amount of energy and nutrients obtained from the recipe spicy salad per 1 person							
No	Recipes	Energy (kcal)	Carbohydrates (grams)	Fat (grams)	Protein (grams)	Iron (mg)	Vitamin A (ARE)	Vitamin C (mg)	Dietary Fibre (grams)
1	“Jub Pak Wan”	29.28	4.78	0.45	1.80	1.54	109.74	16.57	2.09
2	“Jub Pak Ruam”	21.11	3.30	0.32	1.27	0.95	41.32	10.34	1.53
3	“Larb Makhuea Lueang”	61.16	8.47	1.12	4.38	0.84	29.05	17.28	0.84
4	“Jub Moo Sai Bai Faad”	105.72	2.33	8.97	3.95	0.29	6.57	0.74	0.00
5	“Jub Bai Mamuang”	89.28	4.31	4.75	7.93	2.06	42.20	7.88	1.13
6	“Jub Bai Pak Sang”	91.43	9.50	4.04	4.24	2.61	47.52	9.24	0.90

Steamed Food. Tai Dam ethnic people like to steam seasonal vegetables and fruits such as pumpkin, melon, gourds, and long beans. For the food part, animals that can be found in seasons, such as species of a small green frogs, frogs, and fish, were cooked into steam buns. However, for this research study, the groups of housewives chose to cook only one menu: “Paam Khai, “ similar to steamed or poached eggs. The way to cook it was beating the eggs as if making an omelet mixed with chopped seasonal vegetables as you like; season with salt. Then put banana leaves on the crate before pouring the egg mixture onto them, and steam until the egg was cooked.

Nutritional assessment results by using a ready-made computer program to calculate nutrients INMUCAL-Nutrients V3 (Institute of Nutrition Mahidol University, 2013) of steamed food for 1 person, 1 recipe which was “Paam Khai” showed that it provided 45.39 kilocalories of energy, 4.27 grams of protein, high vitamin A of 109 RAE and high nutritional value of vitamin A as can be seen in Table 5.

“Naam Prik” (Chili Paste). Tai Dam ethnic people call it **“Jaw”**. It was a group of dipping dishes that consisted of chili seasoned with salt, fermented fish, and fish sauce. The nature of it was spicy and salty—very spicy. Therefore, it was commonly eaten with vegetables, such as fresh vegetables, and boiled vegetables that come mainly from local sources. Most chili pastes were named after the raw materials used, such as fresh, steamed, or blanched vegetables that came mainly from local sources. Most of the chili paste was named after the raw materials;

however, some recipes were called for their utilitarian value, such as “Jaw Od”, a chili paste made from “Bon Khan” (Elephant Ear). It was unique and popular as a staple food because it could be preserved for a long time.

Table 5. The amount of energy and nutrients in steamed recipes

		The amount of energy and nutrients obtained from the steamed recipe per 1 person							
No.	Recipes	Energy (kcal)	Carbohydrates (grams)	Fat (grams)	Protein (grams)	Iron (mg)	Vitamin A (ARE)	Vitamin C (mg)	Dietary Fibre (grams)
1	“Paam Khai”	45.39	1.44	2.56	4.27	0.63	71.45	3.00	0.09

Nutritional assessment results by using a ready-made computer program to calculate nutrients INMUCAL-Nutrients V3 (Institute of Nutrition Mahidol University, 2013) of “Jaw” for 1 person, 5 recipes: “Jaw Ta Dang”, “Jaw Ma Eod Hom Dang”, “Jaw Od”, “Jaw Kha”, and “Jaw Plarae Fak”, showed that there were at least 2 recipes with the highest energy and nutrients. There was 1 recipe, “Jaw Plarae Fak” or “Jaw Plara Sap” providing the energy of 72.71 kilocalories, 11.90 g carbohydrates, 1.17 g fat, 3.79 g protein, 1.86 mg iron, vitamin A 67.43 ARE, vitamin C 34.14 mg as in Table 6. The dipping sauce recipe with high nutritional value including the highest vitamin A was “Jaw Plara Fak” -steamed and fresh vegetables, followed by “Jaw Kha”-fresh vegetables - boiled vegetables, and “Jaw Ta Dang”. The recipe with the highest energy was “Jaw Plara Fak”- vegetables.

Table 6. The amount of energy and nutrients in chili pastes recipes

		The amount of energy and nutrients obtained from the recipe dipping per 1 person							
N o.	Recipes	Energy (kcal)	Carbohydrates (grams)	Fat (grams)	Protein (grams)	Iron (mg)	Vitamin A (ARE)	Vitamin C (mg)	Dietary Fibre (grams)
1	“Jaw Ta Dang”-Vegetables	36.13	4.89	1.04	1.98	1.00	42.61	15.91	1.46
2	“Jaw Ma Eod Hom Dang”-Vegetables	48.44	8.84	0.49	2.31	1.06	19.60	26.33	3.58
3	“Jaw Od”-Vegetables	28.94	5.07	0.31	1.74	0.92	12.97	18.05	0.67
4	“Jaw Kha”-Vegetables	38.16	7.02	0.36	1.70	1.60	53.78	15.12	1.13
5	“Jaw Plarae Fak”-Vegetables	72.71	11.90	1.17	3.79	1.86	67.43	34.14	2.78

Desserts and Fruits. Most Tai Dam desserts used raw materials from local producers that were easily available: glutinous rice, glutinous rice flour, nuts, taro, sweet potato, sesame, and coconut. The desserts were named differently depending on the ingredients used to cook them.

Nutritional assessment results by using a ready-made computer program to calculate nutrients INMUCAL-Nutrients V3 (Institute of Nutrition Mahidol University, 2013) of desserts and fruits for 1 person, 5 recipes namely “Khanom Mok” (Steamed batter wrapped in banana leaf), “Tom Perk-Tom Mun” (Boiled taros, boiled potatoes), Perilla, “Khaow Hua Ngork” (Steamed sticky rice mixed with little sugar, salt and ground coconut), and “Tom Tua Ka Ti” (Boiled nuts with coconut milk), including seasonal fruits, showed that there were 2 recipes of desserts with the highest energy and nutrients: “Tom Tua Ka Ti” which provided 152.67 kilocalories of energy, 7.32 g fat, 2.36 g protein, 3.214 g fibre, followed by “Tom Perk-Tom Mun” (boiled taros and boiled sweet potatoes) which provided energy 132.83 kilocalories, vitamin C 1.24 mg, as shown in Table 7. Four dessert recipes were nutritious with rich carbohydrates, except Perilla. The highest-energy dessert was “Tom Tua Ka Ti”

Table 7. The amount of energy and nutrients in dessert recipes

The amount of energy and nutrients obtained from the dessert recipes per 1 person

No	Recipes	Energy (kcal)	Carbohydrates (grams)	Carbohydrates (grams)	Protein (grams)	Iron (mg)	Vitamin A (ARE)	Vitamin C (mg)	Dietary Fibre (grams)
1	“Khanom Mok”	114.73	24.61	0.77	1.81	1.58	6.85	2.33	0.24
2	“Tom Perk-Tom Mun”	132.83	21.50	4.83	1.03	1.58	2.50	3.83	1.24
3	Perilla	50.95	6.97	2.18	0.85	1.09	1.08	0.00	0.00
4	“Khaow Hua Ngork”	110.29	20.05	2.86	1.55	0.26	0.00	1.07	0.52
5	“Tom Tua Ka Ti”	152.67	19.55	7.32	2.36	1.47	0.70	3.21	3.78

In summary, the food consumption of Tai Dam or Tai Song Dam ethnicities, Ban Na Pa Nard, Chiang Khan District, Loei Province, Thailand had a unique identity. People used local vegetables from natural sources and grew them with a safe agricultural system. Their suitable community location is a flat area at the foot of the hill. Soil and water are fertile. The environment is safe from pollution. There are natural ecosystems with biodiversity and local plant varieties that are used as food. Therefore, there were more than 30 recipes

of Tai Dam people, which are divided into 6 main types of eaten food. These are considered healthy food wisdom that has been passed on until the present.

Discussion

According to the research study, it can be concluded that there were more than 69 species of local vegetables that are used in the main food of Tai Dam ethnicity with high biodiversity. They are categorized into 3 groups that are used as food ingredients, used as medicinal herbs, and used as fruit and side dishes. Parts of plants that are used: leaves, shoots, fruits, petioles, and tubers. Vegetable sources come from forests and the surrounding natural and fertile areas. Vegetables are grown in a home garden and are clean, safe, and healthy. This is consistent with the findings of Sripoona *et al.* (2021), who found that food in the community would be sufficient according to the principle of sufficiency economy by bringing plant species into the community forest to expand to increase the biodiversity of plants, animals, and mushrooms in the community areas around the forest or adopting exogenous species that have health and economic value without affecting the existence of native plant species.

The traditional food of the Tai Dam ethnicity has a unique identity. There were 30 recipes divided into 6 categories, namely curry, grilled, spicy salad, Homok, chili paste, and desserts, respectively. There were 4-5 recipes in 1 deck (a set menu of food put on a big container like a tray), with sticky rice as the main food. 80% of the food ingredients were local herbs and vegetables sourced, and another 20 percent were meat, fish, chickens, eggs, insects, and small animals. Distinctive features of curry dishes include a variety of herbs. This is consistent with the findings of Surasak (2017) who concluded that vegetable foods contain adequate vitamins to nourish the intestines, liver, and organs responsible for eliminating waste from the body. Cancer experts recommend that patients and the general public eat a lot of fruit and vegetables regularly because they are rich in vitamins and minerals, sources of fibre that are good for the digestive system, and help prevent colon cancer. Moreover, they reduce the risk of cancer spreading in patients. This is also consistent with the finding of Kongkachuichai and Charoensiri (2015) who found that fruit is a source of vitamins, minerals, other nutrients, fibre, and antioxidants that are essential for health. In addition, this is in line with Sripoona *et al.* (2020) found that the nutrient of local food in Chiang Khan District, Loei Province, Thailand, and Chanakam, Vientiane City, Lao PDR was a diversity of local food for more than 100 recipes and raw materials from wild herbs and animals in Mekong River and nearby. Each food set had a ratio of vegetable to protein for 7:3, and one deck contained 2-3 recipes.

Result of evaluating various the nutritional content of traditional recipes food consumed by ethnic communities of Tai Dam in Loei, Thailand, Nutritional content analysis results in recipes with the highest energy and nutrients in 6 or more aspects in each category: Catfish Salad with the energy of 166.17 kcal, 10.53 g fat, and 12.01 g protein. “Oh Pla” provides the energy of 136.11 kcal, 3.68 g fat, and 18.73 g protein and “Ua Dok Mak U” provides 6.68 grams of carbohydrates, 38.11 RAE, vitamin A, 13.14 milligrams of vitamin C, and 0.72 grams of dietary fibre, miscellaneous: “Paam Khai”, dipping: “Jaw Tadang”, “Jaw Ma-Ueard Hohmdang”, “Jaw Od”, “Jaiw Kha”, and “Jaw Plarae Fuk”, sweet: “Khanom Hmok”, “Tom Phueak Tom Mun”, “Nga Jeiang”, “Khaow Hua Ngork” and “Tua Tom Kati”. This is consistent with the finding of Sripona *et al.* (2020) found that nutrients of local food were a high amount of calcium, vitamin A, and vitamin C, but a low amount of fat, and valuable for bone, heart, sight, skin, the strength of red blood cell wall, eyes, and the blood vessels not broken easily and immune to disease.

Following the study of Limpiyapraphan (2015), it was found that eating “Jub Pak” (vegetable spicy salad) was a popular dish of local wisdom up to the present. It is a recipe that does not use oil and is low in fat which is suitable for weight control and the prevention of chronic diseases such as diabetes, high blood pressure, and heart disease. This is congruous with Julakrungra (2015) who concluded that excessive fat consumption leads to obesity, weight gain, slow digestion, and absorption. Vitamin C is abundant in citrus fruits and vegetables, which helps strengthen immunity enhance the absorption of iron anti-oxidant and nourish the skin, prevent and treat scurvy. This is consistent with Kongkachuichai and Charoensiri (2011) who concluded that vitamin A is found in dark green, yellow, and orange vegetables, but they must be cooked with the fat of coconut milk for example, “Burd Fakthong” (Pumpkin in coconut milk with sugar): 1 cup of it contains 81grams of water, some beta-carotene, and lutein, 23% dietary fibre, which is valuable for cell division and build immunity in the body to prevent cancer and night blindness. Dietary fibre is found in fruits and vegetables, whole grains, nuts, and seeds that help prevent obesity, high blood fat, diabetes, and cancer and help excretion. The findings also revealed that the Tai Dam recipes had a high overall nutritional content, suitable for eating as an immune-boosting drug for a healthy life, preventing emerging diseases, and the environmental community should be preserved to obtain high-value food. Therefore, the cultivation of local vegetables should be promoted in every household and Tai Dam food deck (set menus on big containers) should be developed for the community economy as well as continue working on learning management and tourism for healthy food. This is consistent with Pruksa *et al.* (2022) who found that the value of local foods

could be improved by investing in technology used for home preservation actively engaging younger generations to improve the transfer of local food wisdom, investing in technology to utilize local biodegradable materials, and tourist activities based around local food heritage.

In conclusion, the findings revealed that the Tai Dam recipes had a high overall nutritional content, suitable for eating as an immune-boosting drug for a healthy life, preventing emerging diseases, and the environmental community should preserve to obtain high-value food.

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