

Historical overview and contribution of *Dangke* as traditional food to income and public health

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Abstract

Dangke is a traditional food that comes from Enrekang Regency, South Sulawesi Province, Indonesia. *Dangke* is a food ingredient that is sourced from fresh milk, either buffalo milk or cow's milk which has a very high nutritional content and can also be used as an alternative cheese. This review provided information about the history and cultural identity of *Dangke* as a traditional food and its contribution to income and public health. The method used in writing this review was to describe the data and information collected from various sources, both in the form of references and related stakeholders. The history of *Dangke* began in the 1900s, and the manufacturing process has been passed down from generation to generation until now. *Dangke* is a food that is inspired by cultural values, traditions, and beliefs that come from local culture. *Dangke's* business also makes a significant contribution to the local community's income. In addition, the increasing consumption of *Dangke* in the community will contribute to improving health from nutritional intake sourced from traditional *Dangke* cheese.

1. Introduction

Cheese is a highly popular food produced worldwide from the milk of ruminant animals. The main milk components for the transformation of milk into curd are casein and calcium (Moatsou, 2019). Cheese has been a popular food since the days of Greece and Egypt. The word cheese comes from the Latin "*formaticus*", which means "*what is done in a form*" (Leksir *et al.*, 2019). In several countries, cheese represents the most important processed milk product. The basic reason for processing milk into cheese is to preserve and convert perishable food into a stable product with a long shelf life (Bittante *et al.*, 2013). Cheese contains substantial fat and protein, which are rich sources of energy and nutrition and are therefore a suitable source of important nutrients, including the previously noted protein and fat, bioactive ingredients, peptides, amino acids, fatty acids, vitamins and mineral content (Farkye, 2004; Walther *et al.*, 2008). Furthermore, cheese has various flavors and textures, and this diversity is attributable to increasing knowledge regarding cheese production technology, biochemistry and the microbiology of ripening (Farkye, 2004).

Cheese is an important dairy product, that makes a substantial contribution to human health and is therefore inseparable from a healthy diet. Recently, the diet has been linked to various diseases in humans, including

diabetes, obesity, cardiovascular disease, osteoporosis and cancer. However, recent advances in nutritional science have highlighted cheese's contribution to nutrition and health (Walther *et al.*, 2008). Cheese is also consumed as a snack or as part of packaged ready-to-eat dishes and meals. Approximately one-third of the world's milk production is used in cheese making (Farkye, 2004), and in the US alone, cheese production has more than doubled, in the past 25 years (Johnson and Lucey, 2006). The global cheese market is expected to reach \$164.338 million dollars by 2023. In 2016, Europe and North America accounted for nearly 80%, with mozzarella and cheddar cheeses dominating the export market (Perhrson *et al.*, 2020). Worldwide, demand for cheese and cheese consumption continues to increase, particularly with respect to fresh cheese and filata pasta (mozzarella), depending on local socioeconomic conditions and customs (Martinez and Ruiz, 2019).

Today, cheese consumption is widespread throughout the world. However, the amount of cheese eaten differs significantly from country to country. In Greece, France, Germany, Italy, and Switzerland, for instance, the annual consumption level per capita is above 20 kg (Walther *et al.*, 2008). Cheese production first started approximately 8000 years ago, and currently, there are over 1000 types of cheese worldwide, each

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unique in taste and shape. The manufacture of most cheese varieties involves combining three main ingredients, (i.e., milk, rennet, and microorganisms) in several general steps, including gelling, whey removal, acid production and salt addition, followed by a ripening period (Beresford *et al.*, 2001).

Indonesia has several traditional soft cheeses from various regions, including *Dangke* (Enrekang, South Sulawesi), *Dadiah* (West Sumatra), *Dali Ni Horbo* (Tapanuli, North Sumatra), and *Gulo Puan* (Palembang, South Sumatra). Interestingly, these soft cheeses, which are typical of various regions in Indonesia, continue to be produced traditionally to this day (Syah *et al.*, 2017). Enrekang Regency, South Sulawesi Province, Indonesia is one of the areas in Indonesia that produces soft cheese from dairy cows or buffalo milk. This product is a special food termed *Dangke* (Rahman and Rauf, 2013). *Dangke* is a type of semisolid cheese that is available in traditional markets and is traditionally produced by the local community (Malaka *et al.*, 2017).

Therefore, this review aims to provide information about the history and production process of *Dangke*, traditional *Dangke* food as a cultural identity, as well as *Dangke*'s contribution to income and public health. The methodology used in writing this review is data and information collected from various references and related stakeholders and then analyzed using qualitative descriptive analysis. This review is useful in the context of future development of *Dangke*, so that *Dangke* may become more popular such as cheddar cheese (UK), Emmental and grureye (Switzerland), limburgger, cammembert and brie (France), gorgonzola and mozzarella (Italy), and many varieties other cheeses (Malaka *et al.*, 2015).

2. History of *Dangke*

There are many versions of *Dangke*'s history. The popular story tells of Dutchmen who visited the Enrekang area with food in the 1900s. Before departing, the Dutch were presented with a gift of food by Enrekang natives. The Dutchmen subsequently expressed their gratitude using the Dutch phrase "*Dang well*". However, this word was, difficult to understand and was therefore simplified by the Enrekang people into the term *Dangke*. This word has now become the name for a typical soft cheese and, means "thank you" (Malaka *et al.*, 2017). In addition, the term later used to refer to cheese (milk) is assumed not yet to have been invented at that time. Therefore, a spontaneous interpretation of the word *Dank* emerged which was then adapted and agreed to be *Dangke* (Hardiansyah *et al.*, 2020).

Furthermore, *Dangke* processing has been carried

out since 1905, and the cheese-making technique has been passed down through several generations until today and has even developed into a household-scale food industry practised nearly everywhere in Enrekang Regency (Hatta *et al.*, 2013). *Dangke* production is increasing as consumer demand increases in line with the increase in the number of tourism activities (Al-Baarri *et al.*, 2018). The production process was passed down from previous generations; therefore, *Dangke* producers currently make use of ancestral recipes (Andriani *et al.*, 2019). *Dangke* is made from buffalo or cow milk, which is processed using pasteurization and coagulation methods with papain enzymes to separate curd and whey (Syah *et al.*, 2017). In addition (Hardiansyah *et al.*, 2020), the taste of these distinctive foods remains unchanged, and *Dangke*'s taste and aroma and even its texture remain the same as long ago. This is because the community endeavours to maintain the original recipe and materials rather than adding ingredients that could reduce quality in a bid to generate more profit. The process begins with milking, followed by filtering the milk to remove impurities (Hasnita *et al.*, 2018). The main ingredients required are fresh milk, papaya sap (papain enzyme), salt, water, and banana leaves (the latter as packaging material). The equipment used consists of simple kitchen utensils, including stoves, pans, spoons (spatulas), coconut shells as mould materials, wooden spoons, and cups (Rahman, 2014).

Dangke is a soft cheese product, produced by heating milk to a boil. In contrast to cheddar cheese, for which the enzyme rennet is used as a coagulant, *Dangke* uses the papain enzyme, which is derived from papaya sap as a coagulant (Ekayani, 2016). The production process is very simple (Figure 1) and only requires pouring fresh milk into a saucepan, and then heating it over low heat at a temperature of 70-80°C until the liquid begins to boil (Rahman and Rauf, 2013). A few drops of papaya sap are added to curdle the milk, and adequate salt is added, as a preservative and source of savoriness while evenly stirring the milk clumps (Hasnita *et al.*, 2018).

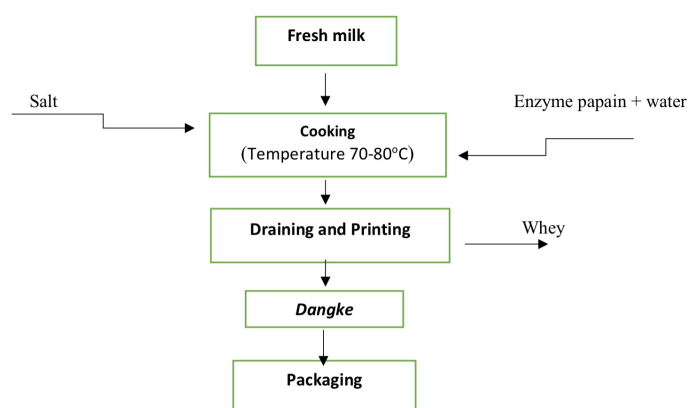


Figure 1. *Dangke* processing flow chart (Rahman and Rauf, 2013).

Subsequently, the clumps are filtered using coconut shells, which also serve as *Dangke* moulds, and wrapped in banana leaves (Sulmiyati and Said, 2018).

To separate the liquid and solid portions, the dough is spooned into the coconut shell and then pressed down using a spoon to drain the liquid (whey). The solid portion of the cheese forms a dome resembling the coconut shell shape of the mould. After solidification, the solid is drained again and then packed using banana leaves (Rahman, 2014). The dome shape and banana leaf wrapping are characteristic of *Dangke* created by the Enrekang community (Sulmiyati and Said, 2018). On average, 1 *Dangke* can be produced from 1.25-1.5 litres of fresh milk (Rahman, 2014). Similarly, 2-3 L of fresh buffalo or cow milk produces only 2 *Dangkes* (Hardiansyah et al., 2020).

Dangke is a traditional food product with high nutritional value and includes water, fat, protein, and mineral contents of 45.75%, 32.81%, 17.20% and 2.32%, respectively (Hardiansyah et al., 2020). Al-Baarri et al. (2018) explained that the nutritional content of *Dangke* in % (w/w) consisted of water (55%), protein (23.8%), fat (14.8%), and ash (2.1%). A study by Malaka et al. (2015) reported that the optimum heating temperature required to create *Dangke*'s typical structure was 75°C using a 0.5% papaya sap concentration, with protein, fat, lactose and lactic acid contents of 17.94%, 24.295%, 14.12%, and 0.296%, respectively, and a pH of 5.93. In contrast, (Mukhlisah et al., 2017) stated that the optimum temperature was 80°C using a 0.3% papain concentration, with protein, water, fat, ash and carbohydrate contents of 16.66%, 58.75%, 15.19%, 2.31%, and 5.88%, respectively. The latter approach results in *Dangke* with pH, curd production and hardness values of 6.62, 15.66% and 752.9 gf, respectively.

3. *Dangke* as traditional cheese and cultural identity

Traditional cheese products are considered a very important way to maintain the cultural identity of a region. Traditional- cheesemaking recipes are passed down from generation to generation, challenging time and space. Traditional cheese is one of the food products that has become the image of various countries or regions of origin. They are different from each other in the manufacturing process (Boudalia et al., 2020). Traditional cheeses are considered to be produced locally or regionally for generations and they have an important place in the food culture of rural areas (Ercan and Korel, 2011). Traditional food integrates cultural values, traditions, and beliefs from the local culture and therefore serves as an image of a region's civilization and culture (Hardiansyah et al., 2020). In addition, traditional food can represent the identity of a tribe or

nation because of its relation to the culture and ethnicity of a nation (Yovani, 2019). Culture is inseparable from the values, beliefs, attitudes and practices accepted by communities and is therefore inseparable from people's lives, thus becoming a matrix for daily behaviour (Mardatillah, 2020). Furthermore, culture is a key concept in people's knowledge of the past and present, and a culture's definition is constantly being developed and refined (Wijaya, 2019).

Dangke is a form of fresh soft cheese (Figure 2) ready for consumption after solidifying and wrapping in banana leaves (Hatta et al., 2013). This commodity was declared a superior local food product by the government of Enrekang Regency and is a highly popular traditional cuisine item (Rahman, 2014). In addition, *Dangke* differs from European cheese and is delicious as a side dish for rice (Hasmah, 2020). The different taste makes *Dangke* much in demand by residents outside Enrekang, such as Makassar and Kalimantan, and it has even spread to the island of Java and Sumatera (Al-Baarri et al., 2018), especially to the Enrekang community outside, to Brunei Darussalam, Malaysia and Japan (Hatta et al., 2013). Furthermore, *Dangke* has been eaten as a traditional side dish in the Enrekang Regency community and is widely known throughout South Sulawesi as well as nationally (Hasnita et al., 2018). Freshly processed *Dangke* is suitable for immediate consumption, and remnant whey is often used as a drink, eaten with rice as a substitute for vegetables (Hardiansyah et al., 2020), or enjoyed with palm sugar or lime sauce (Andriani et al., 2019). In addition to being eaten directly as processed food, *Dangke* is also served in fried or (Figure 3) grilled form (Hardiansyah et al., 2020), mostly in the Enrekang community, or served using a combination of the two methods (Rahman, 2014). Additionally, *Dangke* is processed into smoked form, and in certain cases, further processed into crackers or "*Deppa Dangke*", with high nutritional value (Hardiansyah et al., 2020).



Figure 2. Fresh *Dangke*, which is soft cheese produced by fresh milk that is still in coconut shell molds.

The simplest and most common way of serving *Dangke* pieces in a ready-to-enjoy dish is in grilled (roasted) and fried forms. Prior to grilling, *Dangke* (Figure 4) is usually cut into several pieces to enable easy grilling. Subsequently, *Dangke* pieces are grilled on a frying pan lined with banana leaves. The grilling

process is not difficult and involves simply turning the pieces in the pan to avoid burning for approximately five minutes to obtain ready-to-eat grilled *Dangke* (Hardiansyah et al., 2020).



Figure 3. *Dangke* fried is a special menu that is always available during the implementation of activities in the community and the government of Enrekang Regency. Especially weddings, thanksgiving, circumcision, traditional parties, and religious events



Figure 4. Baked *Dangke* which in its presentation can be consumed with palm sugar as a regular snack and can use lime sauce as a side dish to accompany the rice. *Dangke* baked is always there when there are events, both events organized by the community and local government, such as weddings, traditional parties, thanksgiving, and religious events.

Fried *Dangke* is produced by adding *Dangke* to boiling water and leaving it to boil for 3-5 minutes. Subsequently, the pieces were cut into thin slices, dried with a tissue, and coated with salt to taste. Cooking oil is then heated in a pan, and the salt-coated pieces are fried and turned until *Dangke* becomes an appetizing brown colour and is, therefore, ready to be enjoyed (Hardiansyah et al., 2020). As a typical local food, *Dangke* is always served by people in the Enrekang Regency, especially during important social and governmental events, including weddings, thanksgiving and religious events. This food has long been familiar to the people of Enrekang Regency of South Sulawesi (Hardiansyah et al., 2020). Traditional food, including *Dangke*, has been recognized as an expression of identity, and food culture has emerged as a popular aspect of cultural tourism. Therefore, food is inseparable from the culture in discussions of culinary tourism, and *Dangke*'s role in culinary tourism is becoming increasingly significant. In addition, traditional foods, including *Dangke*, are useful in differentiating the world's tourist destination markets, because a country's cuisine exhibits elements of its culture and national identity (Wijaya, 2019).

4. *Dangke*'s contribution to income and public health

Dangke soft cheese, originating in Enrekang Regency, South Sulawesi, has been a home-developed industry-scale business since 1905 (Andriani et al., 2019). The processing business is categorized as a home industry because from raw material production to processing, cheese is produced by family members. Generally, the primary raw material used to make *Dangke* is fresh milk from domestic livestock. In addition to providing employment to workers in rural areas, the *Dangke* business also serves as a driving force for the economy while helping fulfil the community's nutritional needs (Rahman, 2014). Cheese-making in the US is the economic backbone for many US states and serves as a source of income (Badmos et al., 2021).

Culinary tourism offers a competitive advantage and could become the future centre of destination development, contributing to overall economic performance (Wijaya, 2019). In addition, the asset resources represented by traditional foods, including *Dangke*, include a business sector with higher value due to uniqueness, but unfortunately, this sector has not been utilized properly (Mardatillah, 2020). Small businesses possess flexibility in the face of economic crises due to their low dependence on monetary sector income, and because of their widespread availability in all corners of the country, they represent an effective distribution channel that can reach most people (Rahman, 2014).

Dangke, which is a traditional type of cheese, is a dairy product that has the potential to be developed in Indonesia (Malaka et al., 2015). In addition, income from *Dangke* production in the small-and medium-scale industry contributes an average IDR of 6,393,850 per month (Aziza, 2019). Income generated from household-scale businesses contributes an average IDR of 1,024,520 per month (Hasnita et al., 2018). Therefore, a processing income analysis is required to determine the difference between the amount of product obtained and the costs incurred, during a certain period. An income analysis of breeders and entrepreneurs is also required to formulate a related plan (Aziza, 2019). Therefore, two such analyses could serve as a reference showing that *Dangke* processing, both in the home industry and in small-and-medium- scale industries, has the capacity to increase Enrekang Regency's community income.

Furthermore, from a health perspective, the addition of dry aril to the spread of cheese can produce products with much higher lycopene contents, namely (30.15 g/g); carotene (24.93 g/g); vitamin A (41.55 IU/g); and vitamin C (1.20 mg/g). Thus, a serving size of 1 tbsp (20 g) of cheese covered with aril powder can provide 17%

of the daily value for vitamin A and meets the definition of fortified food and the USDA reference standard for vitamin A (Carbonera *et al.*, 2020). In addition, the consumption of dairy products, such as soft cheese in the form of *Dangke*, has a very low cariogenic potential so it is safe for consumption. The consumption of dairy products, including soft cheese in the form of *Dangke* from Enrekang Regency, has very low *carcinogenic* potential and is therefore safe. According to research, consuming hard cheese, including cheddar, helps prevent dental demineralization through two mechanisms: by stimulating salivary flow and by increasing levels of calcium as well as phosphate in plaque and saliva. In addition, consuming soft cheese, including *Dangke*, helps trigger enamel hardening and acts as a cariostatic. This function is prompted by the casein or calcium phosphatase content in cheese, which stops demineralization and triggers remineralization (Ekayani, 2016).

5. Conclusion

Dangke is a dairy food that has a fairly high nutritional value and is a typical traditional cheese in Enrekang Regency, South Sulawesi Province, Indonesia. Known since the 1900s the processing process has been passed down from generation to generation and consuming *Dangke* is a cultural identity by the people of Enrekang Regency when carrying out certain cultural and religious rituals. The increase in *Dangke* consumption in Enrekang Regency contributes to the income and health of the Enrekang community, and *Dangke* is already an alternative cheese in Indonesia.

Conflict of interest

The authors declare that this article has no conflict of interest with any party.

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