

# Variety and Manufacturing Methods of Native Milk Products in Nepal

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Nepal, the largest of the Himalayan Kingdoms, is but a small country of approximately 141,400 square kilometers. However, Nepal is a small land of great diversity<sup>2)</sup>, because there exist a lot of identifiable ethnic groups. These groups lived formerly apart from each other in isolated mountain valley, and have created their own cultures. Thus, it is a matter of course that there is also a great variety of foods and food habits in Nepal due to the diversity of ethnic groups. For example, eating habits of milk and milk products, or manufacturing methods of milk products are considerably different among the ethnic groups and precisely represent distinctive features of their cultures.

Historically speaking, fresh animal milk has not long been used for drinking in Nepal. Furthermore, strict Buddhist view is that animal milk should not be drunk as it is robbing the calf. For such habitual and religious reasons, cheese and fermented milks are considered to have naturally developed in this country. Such milk products are essentially traditional in type and has grown in the form of an art inherited from parent to child.

In today's Nepal, the demand for milk and milk products have yearly increased due to the increase of population<sup>2)</sup>. To cope with this demand, remedial action has urgently called for quality improvement, for proper protein utilization, and for greater production of milk products. Due to the effort to approach this objective, dairy industry has rapidly developed for the last decade of 1970s, especially in the urban districts of Nepal. At present, western-type modern dairy plants have been constructed, and milk products such as fluid milk, butter, ghee, cheese and yoghurt are manufactured in these plants.

On the other side of such modernization in the manufacture of dairy products, majority of Nepalese are living diet on their traditional milk products made by their conventional methods. In this paper, the authors described varieties and

manufacturing methods of representative native milk products in Nepal.

This investigation is a part of the authors' investigation in Nepal which was carried out in both 1978<sup>3)</sup> and 1979.

### Investigation

#### 1. A general view of native milk products in Nepal.

The Nepalese milk products have many varieties, and are essentially traditional and primitive in type. In Nepal, milk products are considered to be delicate and excellent food, and to be important food items that conduce to sound health and a long life.

Figure 1 shows the varieties of the milk products in Nepal. As can be understood from Fig. 1, the native milk products in Nepal, are principally classified into the following two groups; fermented milk products and non-fermented milk products.

Among the milk products made from fermented milk, dahi is the most representative. Dahi, with a long history, is a kind of yoghurt. Several ethnic groups

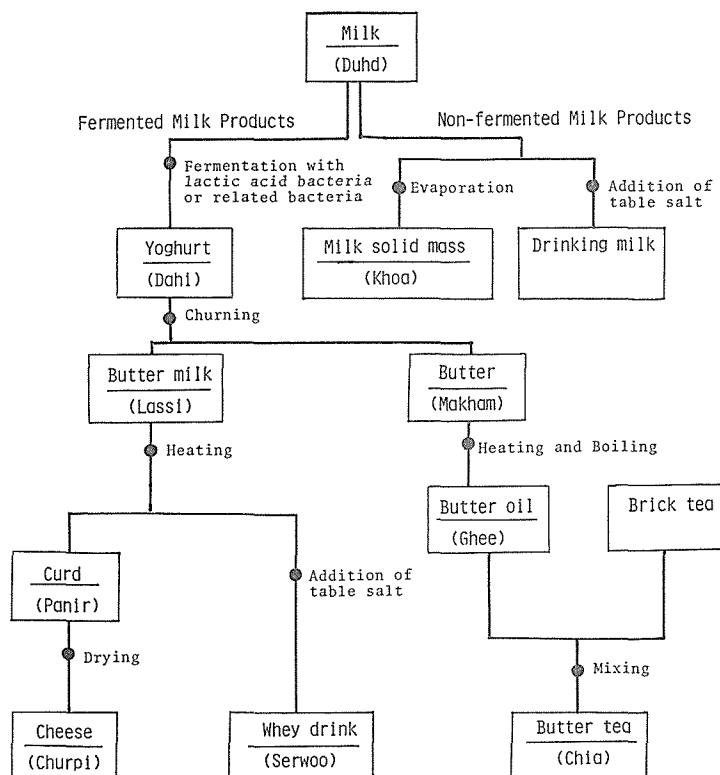


Fig. 1 Varieties of native milk products in Nepal.

consider dahi as a basic item of food which is delicious in itself and which lends itself to tremendous variety of food production. Therefore, it must be emphasized that dahi is an important “hub” for the manufacture of many kinds of milk products. Ghee and churpi, which are the first of their kinds in the world, are made from butter and butter milk, respectively.

Khoa is a representative one among the non-fermented milk products in Nepal. It is a indigenous form of highly concentrated milk. Specifically the ratio of concentration in making khoa is roughly 6 in volume.

There exist great varieties of drinks which are made from milk, whey or milk fat. These drinks are also widely prepared and used for drinks in whole of Nepal.

During the stay in Nepal in both 1978 and 1979, the authors investigated the manufacturing methods of dahi, ghee, churpi and khoa, and described their details in the following sections.

## 2. Dahi

Dahi is a fermented milk product that has characteristics intermediate between cultured butter milk and unripened cheeses, and the basic medium contains whole milk. The texture may vary from a rennet-like custard to a creamy, highly viscous liquid depending on the milk solid and fat content.

Dahi is the most indigenous and the most popular dairy products, and large quantities of milk are utilized for the manufacture of dahi in both rural and urban areas of Nepal. Milks of various indigenous breeds of cows and buffaloes are usually used for the manufacture of dahi in the central and the southern Nepal, whereas yak and jhopa milks are used in the northern high land. It is generally said that the consistency of dahi made from buffalo milk is better than that of dahi made from cow milk, but the flavour is not so pleasing in the former. According to Indra's description<sup>4)</sup>, dahi is also prepared from soybeans in Nepal. She describes that the dahi made from soybean milk is quite a good quality.

Dahi has been traditionally prepared for the following three purposes, that is, for making butter, for making butter milk, and for use as a food. The use of dahi for making ghee and churpi is the first step in the manufacture of these products as described above.

As a food, dahi is used alone or included as a part of many different food preparations.

In the method of making dahi in families, food stalls and restaurants in villages and cities, milk is usually boiled very briefly and allowed to cool. The milk is transfused into earthenware jars. Small amount of dahi which was made in the previous day is added to the milk as a starter, and they are incubated at a temperature between 25 and 30C for about 12 hours (Fig. 2).

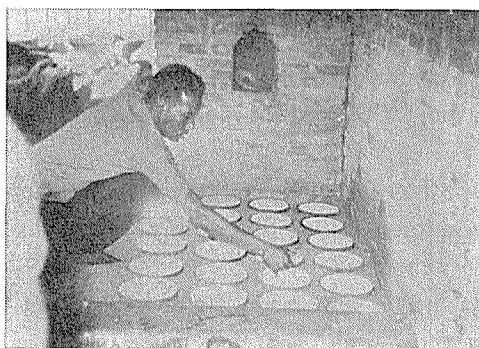


Fig. 2 Incubation of milk for manufacture of dahi.

Microorganisms used as a starters for the manufacture of this home-made type dahi are considered to be thermophilic lactic acid bacteria<sup>5)</sup>. However, the data regarding to the bacterial identification of the microorganisms present in the dahi are not completely enough. The authors are trying to identify the bacterial species present in the dahi samples which were collected from various places in Nepal.

Dairy plants, however, cannot depend upon the procedures used in families, food stalls and restaurants. High investment in equipment and facilities, laws, and critical market requirement are always requested. For these points to see, selection of milk and starter cultures is a matter that must be considered to be an important factor.

The composition of dahi varies according to fat and total solids content of raw milk used for its preparation. The average fat and S. N. F. contents of dahi vary between 3.5 and 5.0, and 8.0-8.5 percent, respectively<sup>5)</sup>. The most common lactic acid bacteria used in dairy plants for souring of milk are *Lactobacillus bulgaricus*, *Streptococcus thermophilus*, *Str. faecalis*, *Str. lactis*, *L. casei* and *L. plantarum* in order frequency.

In the plant of Dairy Development Cooperation in Kathmandu, various kinds of mixed starter culture preparations from market sources such as Chr. Hansen's Laboratorium (Denmark) or International Yogurt Company (U. S. A.) are used as starter cultures.

### 3. Ghee

A kind of clarified butter, more properly called butter oil, is used in Nepal. This is called ghee in Nepal. Ghee is generally prepared from milk of cows and/or buffaloes. Buffalo milk churns more easily than cow's milk, and owing to the higher fat content of buffalo milk the yield is greater. Ghee is not actually in the original milk, owing to changes in involved during lactic fermentation of milk and heating processes in the clarification of ghee. Although changes of the fat during the manufacture have not been chemically studied, undoubtedly there occurs some hydrolysis in the fat which liberates free fatty acids.

Historically, the manufacture and use of ghee date back to time immemorial, and there is no doubt that ghee has been used in continuous rivalry with vegetable oil and has submerged the later in domestic use because of its constant supply from

the milch animals.

Ghee is usually manufactured from the intermediate product, butter, by melting and dehydration in the “boiling” process. The resulting crude ghee is sold as such to ghee marchants who subject the crude material to a further “heating” process to blend and further dehydrate and purify the ghee.

When ghee is made in small quantities, milk is allowed to sour at a fairly constant temperature until clotted, or otherwise change into dahi. A lipid (or solid) fat-rich fraction is then churned from the dahi in a paddle churn by rotating paddle working. After the working, the fat is collected and transferred usually by hands into another brass vessel, in which daily yields of butter are collected. The butter is then heated, and the under layer of water and curd are brought to the boil, while the fat on top is collected. The water is boiled off briskly at first and then more gradually. A scum of solid material forming on top of the fat is skimmed off carefully from time to time. When all the water is evaporated, the temperature of the fat rises above 100C. The curd changes to brown and particles are seen in the convection currents in the fat. The butter is then sufficiently boild, and allowed to cool. The fat layer is carefully removed into a suitable vessel, and allow to crystallize.

Figures 3, 4 and 5 show various types of the paddle churns, and the details of the methods for rotating them are described in our previous paper<sup>3)</sup>.

Some attention must be paid for making ghee direct from cream. In this method, cream of which fat content is 40 to 70 percent is boiled in the same way as the butter is treated in the method described above. The cream breaks in the process and the fat forms as a layer on the top, while the excess of watery layer at the



Fig. 3 Churning of dahi with a rotary type churn (Thaykiy).

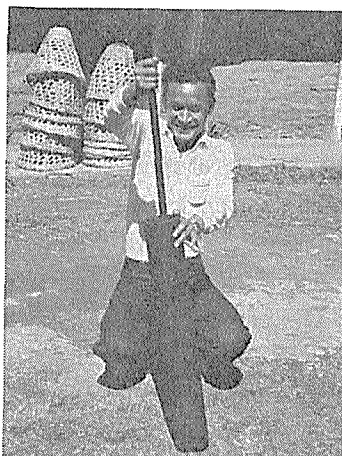


Fig. 4 Churning of dahi with a tub type churn (Dongmo).

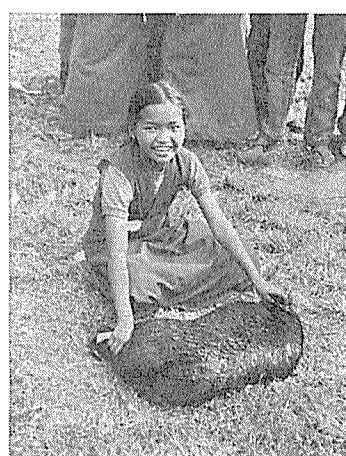


Fig. 5 Churning of dahi with a skin-bag type churn (Shoktokpa or Khalwa).

bottom is run off. The mixture is then boiled until the curd is browned, and the ghee separated by carefully running off the fat layer. The ghee can withstand heating to 120C but not above 123C, because of formation of burnt flavour. The ghee requires further purification by the usual heating process.

Large scal processes of ghee are essentially of the same principles as that described above. Large scal processes admit of accurate control and of easy methods for separating the ghee layer. Greater depth of ghee also give layers more free from sediment, and most of this product does not require reheating unless further blending is necessary.

There are many forms of ghee boilers working on a large scale in use but they differ only in detail. To prevent overheating of ghee, a jacketed boiler with a liquid of high boiling point in the jacket may be used. Such apparatus may also be applied to the second stage in ghee clarification.

It is important not to heat ghee too high temperature during boiling process. The temperature to be used varies with the quality of the raw material, particularly its acidity. The main point to bear in mind is that butter of low acidity will give fat of higher acidity. The best criterion is how the fatty layer behaves in the ghee boiler. After the moisture has been boiled away from the ghee, temperature is gradually rised, during which the traces of moisture are driven off and the curd commences to turn brown. If fat has a high acid value, it is due to acidity of the whey. Acidity in the whey is due to the lactic fermentation of the bacteria in the previous ripening process during which a small amount of protein breakdown occurs. Protein breakdown products form brown color at a lower temperature with the lactose in the whey.

Heating is one of the important processes for the manufacture of ghee. This process must not be confused with ghee boiling; ghee boiling must always be done at temperatures above 100C to remove all traces of moisture. Ghee heating must be carried out at temperatures not exceeding 85C, and is a process of melting ghee in large lots so as to make blends of ghee to suit a particular market or taste, and to purify ghee further; the purification is effected by rising the temperature of the fat to such a level that its mobility and the difference of density between fat and curd are optimal for the rapid sedimentation of fine curd particles which always present in ghee. The process is rapid and the ghee can be run off and filtered from the heating vessel straightway into the packing tins, as the ghee does not require any further refinement. The overall loss of butter fat in this process is very small and with ordinary efficiency is about 1 to 2 percent only.

Table salt is sometimes used during the clarification and the heating of ghee. The addition of salt may have beneficial effect in hastening the rate of sedimentation of curd. Salt solution in minute droplets in ghee will cause corrosion of the

tins holding the ghee. Thus, using of salt is not usually encouraged.

#### 4. Churpi

Churpi is one of the most unique and primitive cheeses in the world. This type of cheese has traditionally been manufactured from yak or jhopa milk by the ethnic groups such as Thakalis, Sherpas or Tibetans in Nepal. Most of these ethnic groups inhabit in the northern highland in Nepal.

Both ethnic groups, Thakalis and Sherpas are originally Tibetans with Mongoloid features. The Thakalis come from Thak Khala, a high valley of the Kali Gandaki river in the central Nepal.

The Sherpas are the famous people in the legends of mountaineering. They inhabit in northern districts or the Sagarmatha zone along the river Dudh Kosi.

Due to long and severe winter type climate and to exceeding dryness in the northern high lands in Nepal, these ethnic groups are forced to practice cattle breedings. As generally well known, yak and jhopa are most representative and useful animals for milk production (Fig. 6) and land cultivation.

Making of churpi and related foods from these milks are, therefore, most important contribution to their civilization. Historically, these milk products have enabled populations to survive periodic famine; nutritionally, they provide elements vital to good health, making them desirable in a man's daily diet.

Manufacturing method of Churpi is considerably simpler compared to those of most of western type cheeses; Fresh milk is heated in a pot to about boiling point and then stand to cool. To this milk is added certain amount of "dahi" (starter culture). The proper proportion is one part of dahi to two or three parts of milk. They are incubated for about 4 hours or overnight at room temperature. After incubation the coagulated milk is emptied into a churner (Tolumu) (Fig. 7) and is then churned by rotating paddle working for about 30 minutes. After the working,

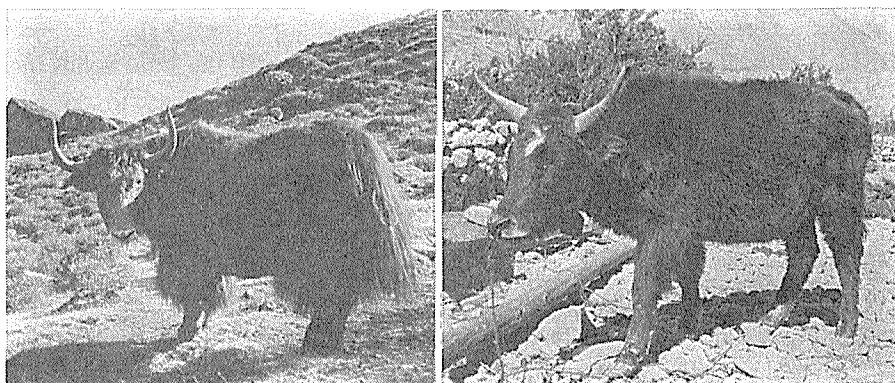


Fig. 6 Yak (left) and Jhopa (right), which are most representative cows in the Nepal Himalayas.



Fig. 7 Churn of dahi with a tub type churn (Tolumu).

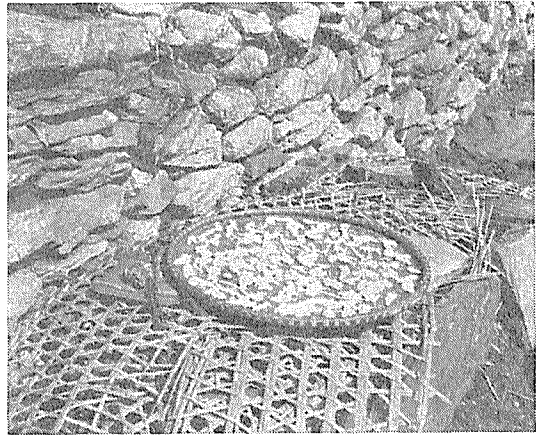


Fig. 8 Drying of curd for manufacture of churpi.

the butter is removed by hands. The skimmed milk (Tharara) is then heated to a boiling point, and the heating is continued until there is a satisfactory coagulation. The coagulated milk is then put in a cloth and dripped off for certain hours. The curd obtained is squeezed through the fingers into noodle forms or is divided into small blocks. These cheese curds are spread out to dry on a bamboo tray (Fig. 8) or on a bamboo mat.

Recently, the authors reported chemical composition of churpi cheeses which had been collected from the areas in the northern Nepal<sup>6)</sup>. General chemical composition of churpi was characterized by low moisture, low fat and high protein contents, that is, moisture content of churpi was about 9 percent in average, and protein content in the total solid was above 80 percent.

##### 5. Khoa

Khoa is milk from which the moisture is driven off until the total solids increased to 70 to 75 percent, and the moisture content reduced to 25 to 30 percent (Fig. 9). Khoa is white in color with only a slight tinge of brown in the best quality. Khoa should be a compact mass of very small uniformly sized granules not showing any signs of leakage of water, or of excessive free fat around the granules.

Khoa must be made only from small volumes of milk at one time. Large volumes of milk can not be controlled easily during the last stage of making. The preparation is laborious, time consuming and requires patience and practice. The boiling and evaporation is carried out in a small shallow round-bottomed iron pan of about five liters capacity fitted with small loop handles and placed over a brisk



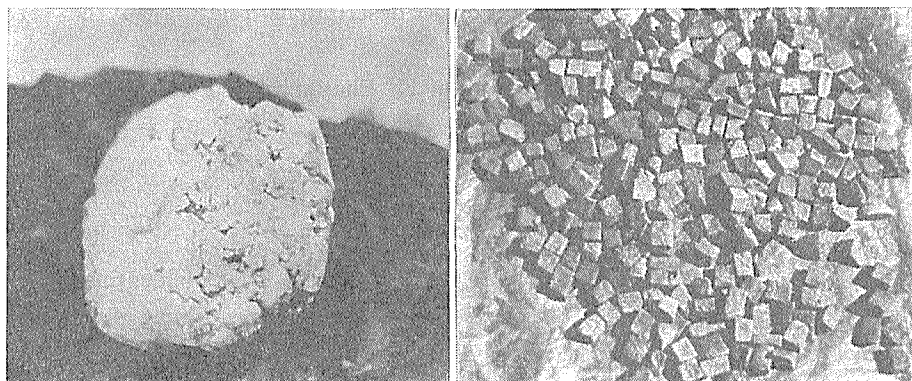


Fig. 9 Khoa (left) and Churpi (right).

fire (Fig. 10).

Milk is poured into the pan and brought to the boil stirring continuously with a stirrer with a circular motion and highly scraping all parts of the pan with which the milk comes into contact. When the milk becomes viscous it is vigorously stirred and moved continuously off the metal surface. In the final stages when the product begins to dry up, very close attention is necessary. The final condition is judged by experience and all particles of milk are collected into a circular pat. The pat is collected and shaped on the side of the pan with ladle. The whole process takes for 4 to 6 hours.

Khoa may be made from cow or buffalo milk. The higher fat content contributes a smoother body and texture to the product. Good quality raw milk is always required for obtaining good texture.



Fig.10 Evaporation of milk in a shallow round-bottomed iron pan (Karahi).

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### Summary

Nepal is a small land of great diversity. There exist a lot of identifiable ethnic groups. Due to the diversity of ethnic group, there are also great diversities in foods and food habits. Therefore, eating habits of milk and milk products or manufacturing methods of milk products are also different among the ethnic groups.

Generally speaking, the Nepalese milk products have a long history and many varieties. These milk products are principally classified into two groups—namely, fermented milk products and non-fermented milk products.

Among the fermented milk products, dahi, ghee and churpi are the most representative ones in Nepal. On the other side, the most representative non-fermented milk product is khoa.

In this report, details of the manufacturing methods of these native milk products in Nepal were described.

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## ネパールにおける乳製品の種類とその製造法

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## 要 約

ネパールは国土は狭いが数多くの部族を擁した国家である。この部族の多彩さは食物と食餌習慣に大きな多様性をもたらし、乳や乳製品の利用と製造法にも際立った特徴が認められ、素朴さの中に豊かな独創性を窺うことが出来る。

一般的に言って、ネパールの乳製品は長い歴史を有し、多彩な乳製品は発酵型と非発酵型に大別される。代表的な発酵型乳製品として、それぞれヨーグルト、バター油、チーズの一種であるダヒ (dahi)、ギー (ghee)、チュルピー (churpi) が挙げられ、また代表的な非発酵型乳製品として乳を濃縮固化したコア (khoa) が挙げられる。

本報はネパールにおけるそれら代表的な乳製品の製造法について筆者らがネパールの各地で調査し、得られた知見をもとにまとめたものである。