

## Research Article

# Nepalese legal standard of milk and common milk products and its implications

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## ABSTRACT

The milk and milk products are diversified and there is increasing awareness about the quality standards of products among the consumers. Therefore this study reviewed the legal standard of milk and common milk products in Nepal and its implications using desk review and exploratory research. In Nepal, the department of food technology and quality control has developed several legal standards for the quality assurance of milk and milk products. National Dairy Development Board has established the Code of Practice for Dairy Industry 2004 which directs six criteria for the standardization of milk and milk products like Organoleptic test, Clot On Boiling (COB) test, Alcohol Test, Fat test and Solids-Not-Fat (SNF) test, Adulteration test, phosphate test, and microbial and coliform test. The review identified the quality standards of milk products like ghee, butter, paneer, milk powders but some quality parameters for ice-creams and cheese are still missing. The research identifies the quality non-compliance rate of milk and milk products that is about 19% which is in a decreasing trend. To the effective implementation of the legal standards, maintenance of health and hygiene of livestock at the production site, lab and infrastructure support at the distribution site, and creating consumer awareness to the consumer site is imperative.

**Keywords:** Dairy Sector, Quality standard, Milk product

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## INTRODUCTION

The dairy sector is an integral part of Nepalese farming systems. It is also important as it is a source of income for rural poor, it contributes to nutritional security and household income (Timsina, 2010). Milk and dairy products are considered to be an important source of protein, fat and vitamins. In the case of Nepal, especially milk is more popular and mostly consumed as a daily diet of people. In Nepal, dairy market has undergone significant structural changes over the last two decades as the milk production has expanded by an annual average compound growth rate of almost 3.15% per annum (Upadhyay *et al.*, 2017). To sustain this sector there need for product diversification and powder milk production are of immense importance in long run (Sharma, 2017).

Food safety and quality are a rising concern all over the world particularly when it comes to human health. In this regard, many countries have been running quality control and legalization programs for all food ingredients including the animal source (Merwan *et al.*, 2018). The safety standards are not only important for public health but also to avoid the negative impression during international trade. Milk quality tests are designed to ensure that milk products conform to the accepted standards for chemical composition and purity as well as levels of a variety of micro-organisms (Vijayan & Prabhat, 2015). In Nepal, the department of food technology and quality control has developed several legal standards for the quality assurance of milk and milk products. National Dairy Development Board has established Code of Practice for Dairy Industry 2061 (2004) which directs six criteria for the standardization of milk and milk product like Organoleptic test, COB test, Alcohol Test, FAT, and SNF test, Adulteration test, phosphate test, and microbial and coliform test (NDDDB, 2004). This paper tries to explore the present legal standard of milk and milk products, the implementation status, legal institution related to the implementation of standards, and policy required to promote adoption of the legal standards.

## METHODOLOGY

The study used the review of secondary information published by different institutions related to the Dairy sectors in Nepal. The majority of the data were retrieved from an online source. The annual reports and publication series were collected from the respective organization. The study follows an exploratory research technique to gather views and responses regarding factors that are responsible for the adoption of these standards.

## RESULTS AND DISCUSSION

### A. Organizational and policy framework for the regulation of legal standard

In Nepal, organized dairy development activities began in 1952 with the establishment of the Yak cheese factory in the Rasuwa districts under FAO assistance (FAO, 2010). The dairy sector gets acceleration on its growth with the establishment of the Dairy Development under the Department of Agriculture (DOA) in 1954 (GIDA Nepal P.Ltd, 2012). The First Five Year Plan (1956-61) stressed the need to develop a modern dairy industry (NPC, 1956).

#### **Policy Framework**

##### ***Dairy Development Policy, 2007***

Dairy Development Policy has tried to review and update of quality control of milk and dairy products; preparation and implementation of appropriate packing standard of milk and dairy products; regular quality monitoring of the marketed milk and dairy product; consumers' awareness about storage methods, consumption duration, consumption methods of these products; implementation of code of practice for milk collection and processing at the milk chilling centers and dairy processing factories; and strengthening of laboratories at different levels for supporting the production and marketing of quality milk and dairy product.

##### ***Food Act, 2023 B.S***

Food safety regulation in Nepal began in 1966 by enforcing the food act and Food rules 1970 by the government. It is the primary legislation governing the regulation of food safety in Nepal (Bajgain, 2012). The food acts prohibited to produce, sell, distribute, export, or import any adulterated food or sub-standard food or hold such food for any of such purposes. This

also prohibited sell or distribute any food by lying or misleading that food to be another food or any food of lower standard to be of a higher standard. This act has a provision to form a standard fixation committee to update standards from time to time. Also, the government has the right to specify the quality standard of the food (Government of Nepal, 2023).

### **Animal health and livestock services act 1998 and Regulations 1999**

The animal health and livestock service act 1998 and regulations 1999 have been formed and enforced for the healthy production, sale, and distribution of animal and their products. The act also regulates the import and export of livestock, their products, and livestock production material important for food and health purpose of the people. The act made the provision for animal quarantine posts to regulate the import of animals, animal products, and animal production materials

### **Institutional Framework Dealing with Quality**

#### **National Dairy Development Board**

National Dairy Development Board (NDDB) was established in 1992. This organization assists the Nepal government to formulate the different policies and plans related to the Dairy sector. It also provides technical assistance for setting-up, improving, promoting, and safeguarding dairy industries (GIDA Nepal P.Ltd, 2012).

#### **Dairy Development Corporation (DDC)**

DDC was established in 1969 under the Corporation Act of 1964, known by its acronym DDC. DDC is a completely state-owned corporation initiated for the economic development of the poor farming communities. It provides a guaranteed market for milk to the rural farmers with a fair price; supply pasteurized milk and milk products to urban consumers; develop organized milk collection system to meet the increasing demand for pasteurized milk and milk products and develop an organized marketing system for milk and milk products in urban areas.

#### **Department of Food Technology and Quality Control**

Department of Food Technology and Quality Control (DFTQC) was established in 1961. This organization has been mandated with quality control of dairy products, research, and development of food processing and nutrition support programs. DFTQC is the sole governmental agency for implementing the Food Act for the enhancement of quality and safety of food and feed products in the country. Recently Nepal government-endorsed the National food safety policy 2076 (2019) to build a consolidated food standard and safety.

#### **Department of Livestock Services (DLS)**

Department of Livestock Services also shares some responsibilities for the implementation of rules and regulation in animal production to ensure the safety of animal origin food. Enforcement of Animal Health and Livestock Services Act 1998, Animal Health and Livestock Services Regulation 1999, Animal Slaughterhouse and Meat Inspection Act 1999, and Animal Slaughterhouse and Meat Inspection Regulation 2001 are under the jurisdiction of this department. Moreover, animal disease surveillance, management of animal quarantine check posts, regulation of the drug, and hormone used in food animals are some of the major responsibilities of the DLS.

### Other Institutions

National Council for Standards (NCS) is the government body responsible to approve and endorse Nepalese standards. Nepal Bureau of Standards and Metrology (NBSM) acts as the secretariat for the NCS which prepares the country standards (Nepal standard) of food products and methods of food processing

### International membership

In the present world of interdependence and economic globalization international relationships, bilateral and multilateral agreements, and international trade also affect the policy, rules, and regulations of a country. The country has to comply with the rules and regulations of such international organizations and agreements. Nepal is a member of the following international organizations which affects the food safety-related policy, rules, and regulations.

- Codex alimentarius commission
- World trade organization (WTO)
- Food and agriculture organization (FAO) of the United Nations (UN)
- South Asian Association for regional cooperation (SAARC)/
- World organization for animal health (OIE)
- Bay of Bengal Initiative for Multi-Sectoral Technical and Economic Cooperation (BIMSTEC).

## B. Standard of milk and milk product in Nepal

### Fresh milk

Milk is defined to be the lacteal secretion, practically free from colostrums, obtained by the complete milking of one or more healthy cows, five days after and 15 days before parturition (Parajuli *et al.*, 2018). Milk standards for fat and SNF are different for species of buffalo and cow. The legal Standard of milk is given in Table 1.

**Table 1: Standard Measure and Standard Value of Fresh Milk of different livestock**

SN	Species	Minimum Milk Fat%	Minimum SNF <sup>1</sup> %
1	Cow milk	3.5	7.5
2	Buffalo Milk	5	8

*Source: Food Standard, DFTQC, 2019*

### Milk products

#### Ghee

It is a type of clarified butterfat that is made from milk, cream, or butter of several animal species. Ghee processing may be achieved by drawing fat from milk, cream, or butter using direct heat with or without fermentation (Kumar & Naik, 2018). The legal Standard of ghee is given in Table 2.

**Table 2: Standard measure and the standard value of ghee**

SN	Measure	Standard Value
1	Refractive Index at 40 <sup>0</sup> C	From 1.4538 to 1.4559
2	Reichert Meissel Value	More than 18
3	Acid Value	Not more than 6 ml potassium hydroxide per gm ghee
4	Peroxide Value	Not more than 10 ml equivalent peroxide oxygen per Kg Ghee
5	Moisture	Not more than 0.5%

*Source: Food Standard, DFTQC, 2019*

### Cheese

Cheese is made from milk by the combined action of lactic acid bacteria and the enzyme rennin (known as rennet). It is a concentrated form of milk-fat and milk-protein. Hard cheeses have most of the whey drained out and are pressed. Soft cheeses contain some of the whey and are not pressed. Cheese is prepared in 4 stages i.e. Curdling, Draining, Pressing, and Ripening. Gosainkunda Cheese Production Centre in Chandanbari is Nepal's biggest cheese producing centre. There is no legal standard of cheese recorded in Nepal however cheese from the pure-breed yak is golden yellow with 7-10% fat, 19.3% total solids, 5.5% total protein, 0.8%  $\beta$ -lactoglobulin, and 0.3%  $\alpha$ -lactalbumin. Yak cheese produced at high altitudes (>2000 m) showed good organoleptic quality with a ripening index of 26.94 (Neupaney *et al.*, 1997).

### Butter

Butter is a semi-solid mass, which contains approximately 80-85 percent milk-fat, 15-16 percent water, and 2 percent solid-non-fat. It is yellow/white, with a bland flavour and a slightly salty taste (Conner & Marquardt, 2015). The legal Standard of butter is given in Table 3.

**Table 3: Standard measure and the standard value of butter**

S.N.	Description	Standard
1	Only milk fat	Not less than 80%
2	Solid not fat	Not more than 2%
3	Moisture	Not more than 16%

Source: Food Standard, DFTQC, 2019

### Processed milk

The milk which is subjected to pasteurization, boiling, sterilization, or Ultra High-Temperature sterilization/treatment and some modification in attributes like SNF and Fat is called processed milk. Generally, it makes milk healthy for a drink by killing harmful pathogenic microbes and also increases the self-life. The Food Act of Nepal also defined the standard of processed milk as given in table 4 but the act is silent about the protein content of milk. It also emphasizes 0 levels of coliform (harmful bacteria) in processed milk and less than 1000 total plate count/ml. The legal Standard of Processed Milk is given in the Table 4.

**Table 4: Standard measure and the standard value of processed milk**

S.N.	Description	Standard
1	Fat	3%
2	Solids- not- fat(SNF)	Not less than 8%

Source: Food Standard, DFTQC, 2019

### Evaporated milk

Reduced the volume of the milk developed by evaporation and sterilization is evaporated milk (Sharma *et al.*, 2015). This product has several advantages over fresh milk, such as they require less storage space, they retain high quality, they preserve milk's valuable surplus nutrients, and they reduce transportation costs. These products can be used under adverse conditions such as wars, epidemics, or earthquakes, or other natural disasters when fresh milk is unavailable. They are also suitable for specialty food products designed for people such as sportsmen, convalescents, or older individuals (Kalyankar *et al.*, 2016). The legal Standard of different categories of evaporated milk is given in Table 5.

**Table 5: Standard measure and standard value of evaporated milk**

S.N.	Description	Standard
1	Fat	At least 7.8%
2	Milk fat with milk solid	At least 25.9%

Source: Food Standard, DFTQC, 2019

### Evaporated skimmed milk

In evaporated skimmed milk, fat is skimmed and milk is partially evaporated. In sweet condensed milk sugar is added as sweetening materials before the condensation process. In skimmed sweetened condensed milk, this milk fat is skimmed before condensation, and sugar is added as sweetening materials. In partly skimmed sweetened condensed milk similar to skimmed sweetened condensed milk rather in this fat is partially skimmed. The legal standard of the different types of evaporated milk is given in table 6.

**Table 6: Standard Measure and Standard Value of Evaporated Skimmed Milk**

S.N.	Type of milk/Standard parameter	Standard
1	Evaporated Skimmed Milk Milk fat with milk solid	At least 25.9
2	Sweetened condensed milk Milk fat	At least 8%
	Milk solid with fat	At least 31%
	Milk sugar	At least 40%
3	Skimmed Sweetened condensed milk Milk solid with fat	At least 26%
	Sugar level	40%
	Fat	Not more than 0.5%
4	Partly skimmed sweetened condensed milk Fat with milk solid	At least 28%
	Sugar	At least 28%
	Fat	At least 40%
		At least 3% (highest 9%)

Source: Food Standard, DFTQC, 2019

### Creams

When milk is left to stand for some time, fat globules rise to the surface forming a layer of fat (or cream). This can be separated leaving behind skimmed milk as a by-product. The legal standard of creams is given in Table 7.

**Table 7: Standard measure and the standard value of creams**

S.N.	Description	Standard
1	Milk fat	At least 18%

Source: Food Standard, DFTQC, 2019

### Milk Powder

MP is milk products that can be obtained by the partial removal of water from milk. The fat and/or protein content of the milk may have been adjusted, only to comply with the compositional requirements by the addition and/or withdrawal of milk constituents in such a way as not to adulterate whey protein to casein ratio of the milk being adjusted (Kalyankar *et al.*, 2015). The legal standard of milk powder is given in table 8. It is of two types according to their standard and manufacturing process. Milk powder manufactured from whole milk is called whole milk whereas if fat is skimmed during the manufacturing process the powder that formed is called whole milk powder. Milk powder is a highly imported commodity in Nepal.

**Table 8: Standard measure and the standard value of whole milk powder**

S.N.	Description	Standard
	Whole Milk powder	
1	Moisture	Not more than 5%
2	Milk fat	Not less than 26%
3	Protein	Not less than 34%
4	Acidity	Not more than 1.2%
	Skimmed Milk powder	
1	Moisture	Not more than 5%
2	Milk fat	Not more than 1.5%
3	Protein	Not less than 3% <sup>4</sup>
4	Acidity	Not more than 1.5%

Source: Food Standard, DFTQC, 2019

### Paneer/Chhena

Paneer which is also called Chhana or Chhena is a non-fermented cheese made from milk is fresh milk cheese, where the milk is coagulated with an acidic agent (like lemon juice, vinegar, or curd) (Deshmukh & Vyas, 2017). The whey is removed and the coagulated Paneer sets in some time. It is a rich source of milk protein, calcium, vitamin A, phosphorous, minerals, and protein which are required by the body in high proportions for healthy growth and development. The legal standard of Panner is given in Table 9.

**Table 9: Standard measure and the standard value of panner/chhena**

S.N.	Description	Standard
1	Moisture	Not more than 70%
2	Milk fat	Not less than 50%

Source: Food Standard, DFTQC, 2019

### Ice cream

Ice cream is a frozen dairy product made by freezing the icecream mix with agitation. It is composed of a mixture of food ingredients like milk products, sweetening materials, stabilizers, colors, flavors, spice, such as cocoa or vanilla and egg products (Deosarkar *et al.*, 2016). In Nepal, there is no official legal standard for Ice cream however some dairy like Sujal Dairy has set a standard of ice creams like total Fat 5g, Sugar 8%, Energy 96 Kcal, Protein 1.75 gm Carbohydrate 11 gm in 500 ml of Ice cream.

### Permittable Additives

DFTQC has recommended the standards for permittable additives. The details of permittable additives are given in the Table 10.

**Table 10: Permittable additives in milk and milk products**

SN	Particular	Standard
1	Stabilizer	Not more than 5 g/kg
2	Firming Agents	Better production techniques
3	Acidity regulators	Not more than 5 g/kg
4	Emulsifier	Better production techniques
5	Anti-caking agent	more than 10 g/kg
6	Anti-oxidants	more than 0.5 g/kg

### Export and import of milk and milk products in Nepal

The government of Nepal (GoN) has recommended some quality standards in terms of the fat percentage. Major quality standards for the milk and cream in powder, granules, or other solid forms should have greater than 15% fat, and sweetened milk and cream in powder, granules, or other solid forms should have less than and equals to 15% fat. The import of

major milk and milk products are shown in Table 11. The export is negligible as compared to import.

**Table 11: Import of milk and milk products in Nepal.**

SN	Commodity Description	Unit	Quantity	Import Value in Thousands
1	Milk and cream of >1% but =<6% fat, not concentrated or sweetened	kg	48767	32998
2	Milk Of a fat content, by weight, exceeding 10 %	kg	65858	41865
3	Milk and cream in powder, granules or other solid forms of =<15% fat	kg	74861031	12996285
4	Milk and cream in powder, granules or other solid forms of >15% fat, unsweetened	kg	19200216	6892873
5	Milk and cream in powder, granules or other solid forms of >15% fat, sweetened	kg	164976085	91197394
6	Concentrated milk and cream, unsweetened ( excl in solid form)	kg	14982	32827
7	Sweetened milk and cream (excl in solid form)	kg	390951721	2433961
8	Yogurt	kg	46	21957
9	Buttermilk, curdled milk, and cream, etc (excl. yogurt).	kg	417566	1154816
10	whey & modified whey, whether or not concentrated or containing sweetening matter	kg	183125	2086968
11	Products consisting of natural milk constituents	kg	103145	449902
12	Butter	kg	234334	12119133
13	Other fats and oils derived from milk (exc l. butter and dairy spreads).	kg	24989495	1419732
14	Fresh (unripened or uncured)cheese, including whey cheese and curd.	kg	2861	162202
15	Grated or powdered cheese, of all kinds	kg	38165	2110406
16	Processed cheese, not grated or powdered.	kg	1422674	872771
17	Cheese, nes	kg	24676581	1371894
	Total Value			135397984

Source: MoAD, 2018

**Table 12: Import of major milk and milk product in Nepal**

SN	Commodity Description	Unit	Quantity	Export Value in Thousands
1	other fats and oils derived from milk (exc l. butter and dairy spreads).	kg	189317	84114
2	cheese, nes	kg	46412	62978
3	sweetened milk and cream (excl in solid form)	kg	8081	7411
4	milk and cream in powder, granules, or other solid forms of =<15% fat	kg	11101	6747
5	Butter	kg	14970	4675
6	milk and cream of =<1% fat, not concentrated or sweetened	kg	2572	2459
7	products consisting of natural milk constituents	kg	15341	1808
8	milk Of a fat content, by weight, exceeding 6 % but not exceeding 10 %	kg	800	586
9	milk Of a fat content, by weight, exceeding 10 %	kg	150	177
10	milk and cream in powder, granules, or other solid forms of >15% fat, sweetened	kg	10	117
	Total Export value			171022

Source: MoAD, 2018



### Status of implementation of the legal standard of milk and milk products in Nepal

The data shows that there is non-compliance with the legal standards (19.44%) of the milk products in Nepal in 2018/19 (DFTQC, 2018) as compared to another food group. Annually non-compliance rate is declining as shown in Table 13.

**Table 13: Non-compliance rate of milk and milk products**

SN	Years	Total sample	Non-compliance	Non-compliance %
1	2018/19	144	28	19.44
2	2017/18	192	101	52.60
3	2016/17	180	49	27.22
4	2015/16	141	34	24.11
5	2010/11	109	60	55.05
6	2006/07	80	30	37.50
7	2004/05	83	51	61.44

(Source: DFTQC Annual report 2004/05 to 2018/19)

### Factors that are responsible for the lower quality standard follow up

According to a rapid exploratory survey among the key stakeholders at Kathmandu and Chitwan districts, the following major factors are identified that hinder to maintain the adoption of the quality standards of the milk and milk products

#### Farmers Perception

- Higher disease, parasites attack at the farm level
- Poor access to better technology/inputs
- The high cost of milk production and lower milk price so they are not willing to invest in quality
- Lack of good quality feeding material at lower cost

#### Dairy industry perception

- Consumer prefer lower price product
- No strict regulation by governments
- Lack of lab storage and other facilities required for quality milk distribution
- Farmers do adulteration like adding salt, adding flour, etc which is difficult to eliminate at the dairy site

#### Government Side Response

- Lower monitoring frequencies
- Illegal imports of dairy products
- 

#### Consumers perception

- Lack of mass awareness about quality parameters of dairy products.
- Limited options to buy the products (except city area)
- Unavailability of product information on websites and printed form
- Lack of clear labels on different products.
- Willing to pay more price for quality products.

### CONCLUSION

Dairy sector is one of the leading agribusiness sector in Nepal. This sector nowadays, getting flourished due to consumer's awareness about the nutritious diet and health concerns. This sector provides more consumer satisfaction due to diversified products. However, some

challenges are emerging with their quality standard. Most of the consumers are health conscious of what they eat. In these scenarios, the standard guidelines provide benchmarks for production. A study showed that the legal standard of almost all milk products and raw milk has been found in the DFTQC website and reports however legal standard for cheese and ice-creams are still missing. These products are highly popular in Nepal therefore there is also a need for the quality standard. The research identifies the quality non-compliance rate of milk and milk products that is about 19% which is in a decreasing trend. To the effective implementation of the legal standards, maintenance of health and hygiene of livestock at the production site, lab and infrastructure support at the distribution site, and creating consumer awareness to the consumer site is imperative. Therefore, farmers should provide training related to sanitary measures. Similarly, the government should strictly inspect and regulate quality aspects at the dairy site. They should be provided with the laboratory facilities and incentives for following the quality aspects if required. Though the effort has been done to disseminate the information regarding the quality aspect through mass media like radio, FM, and television but is inadequate. The government should publicize the printed materials and supply them adequately to the concerned stakeholders. Consumers were willing to pay more price for quality products but it needs to be further investigated how much extra money they want to pay for which attributes.

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#### **Authors' contributions**

N. Upadhyay designed the research methodology, reviewed data, and wrote the paper in consultation with K. Timsina. B. Khanal and Y. Acharya provided feedback on the paper.

#### **Conflict of Interest**

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

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