

ANNEXES

Annex 1

CODE OF PRINCIPLES CONCERNING MILK AND MILK PRODUCTS *

**drawn up by a committee of government experts
under the auspices of the Food and Agriculture Organization
of the United Nations**

Application of the Code

Governments are requested to inform the Director-General of FAO [by 1 September 1960] whether they intend to apply the provisions of the Code of Principles as set out below. Governments which so declare their willingness to apply the Code are further requested to state whether they can indicate the date by which they will be able to bring their national requirements into conformity with its provisions, as well as the steps they will require to take in order to achieve this position.

This Code of Principles is not intended to affect the adoption and use of more rigorous requirements or standards under domestic legislation.

PREAMBLE

The purpose of this Code of Principles is to protect the consumer of milk and milk products and to assist the dairy industry on both the national and international levels by:

ENSURING the precise use of the term “milk” and the terms used for the different milk products;

AVOIDING confusion arising from the mixing of milk and/or milk products with non-milk fats and/or non-milk proteins;

PROHIBITING the use of misleading names and information for products which are not milk or milk products and which might thereby be confused with milk or milk products; and

ESTABLISHING (a) definitions and designations, (b) minimum standards of composition, and (c) standard methods of sampling and analysis for milk and milk products.

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Article 1

MILK

1.1 The term "milk" shall mean exclusively the normal mammary secretion obtained from one or more milkings without either addition thereto or extraction therefrom.

1.2 Notwithstanding the provisions of Article 1.1 the term "milk" may be used for milk treated without altering its composition, or for milk the fat content of which has been standardized under domestic legislation.

1.3 The term "milk" may also be used in association with a word or words to designate the type, grade, origin and/or intended use of such milk or to describe the physical treatment or the modification in composition to which it has been subjected, provided that the modification is restricted to an addition and/or withdrawal of natural milk constituents.

1.4 In international trade, the origin of the milk shall be stated if it is not bovine.

Article 2

MILK PRODUCTS

2.1 The terms used to designate milk products shall only be employed for those products which are exclusively derived from milk as defined in Article 1.

2.2 Notwithstanding Article 2.1, the terms used for each milk product may be employed when substances necessary for the manufacturing process are added, provided that these substances are not intended to take the place in part or in whole of any milk constituent.

2.3 The terms used to designate milk products may also be used in association with a word or words to designate the type, grade, origin and/or intended use of such milk products or to describe the physical treatment or the modification in composition to which they have been subjected in accordance with Articles 1.3 and 2.2.

Article 3

COMPOSITE PRODUCTS

3. The term "milk" and the terms used for milk products may also be employed together with a word or words to designate composite products of which no part takes or is intended to take the place of any milk constituent and of which milk or a milk product as referred to in Articles 1 and 2

is an essential part either by quantity or for characterization. If such composite products are designated in terms which are suggestive of milk or milk products or the dairy industry, the label shall indicate the milk or milk product used as well as the other essential constituents.

Article 4

OTHER PRODUCTS

4.1 A product which is neither milk, nor a milk product, nor a composite product as referred to in Articles 1, 2 and 3, whatever its origin, source or composition, shall not be described or designated in any label, commercial document or publicity material by word or pictorial devices, or be presented in such manner as to refer to or be suggestive of milk or milk products or other dairy term, if likely to lead the purchaser and/or consumer to suppose that the product is milk, a milk product or a composite product as referred to in Articles 1, 2 and 3.

4.2 Without restricting the scope of Article 4.1, whenever products foreseen by that Article are of such nature as to be likely to lead the purchaser and/or consumer to suppose that they are products as referred to in Articles 1, 2 and 3, the designation of such products shall be presumed to meet the requirements of Article 4.1, if carried out in the following manner:

- (a) by the name of the product referred to in Articles 1, 2 and 3 preceded by the word "imitation" in clear type, or
- (b) by a distinct name and/or description indicating the true nature of the principal raw materials used.

4.3 In countries where the mixing of milk or milk products with products foreseen by Article 4.1 is not forbidden, wherever the label of such a mixed product or any publicity referring to it declares the presence of the milk or milk product, the percentage dry matter by weight of the milk ingredients to the total product shall also be indicated, except that where butter is present in a mixture of fats its percentage by weight shall be stated.

Article 5

LABELLING, PRESENTATION AND PUBLICITY

5. No label declarations, methods of presentation and publicity concerning products referred to in Articles 1, 2, 3, 4.2 and 4.3 shall be made in a manner likely to mislead the purchaser and/or consumer as to the true nature or the composition of the product as a whole.

Article 6

EXTENT OF APPLICATION

6.1 Unless otherwise stated, the provisions of this Code shall apply to all products therein considered whether imported, exported or produced and offered for sale upon the home market.

6.2 In view of the relationship between a federal government and its constituent states or provincial governments, wherever some or all of the provisions of this Code are not regarded as appropriate for federal action, federal governments undertake to make effective arrangements for the reference of such provisions to the appropriate authorities with the request that they give active consideration to the amendment of their state or provincial requirements in conformity therewith.

6.3 In adapting their practices to this Code, governments would undertake to give earnest and sympathetic consideration as appropriate to the individual standards established in association with the Code according to resolution No. 16/57 of the FAO Conference.

6.4 This Code and the individual standards established in association with it are not intended to affect the adoption and use of more rigorous requirements or standards under domestic legislation.

EXPLANATORY NOTE
OF THE CODE OF PRINCIPLES

Article 1

MILK

1.2 The term "standardized" refers to the standardization of fat content alone, either up or down. Other possible modifications are referred to in the following paragraph. *Examples of treatment* : clarified, pasteurized or otherwise heat-treated.

1.3 Mention of the intended use may accompany the word "milk". The modifications referred to here are only permitted if restricted to an addition and/or withdrawal of natural milk constituents. Modifications shall always be indicated.

Examples :

Type : Whole and skimmed milk

Origin : Cow, goat, sheep, alpine

Intended use : Infant, school (destined for school-feeding programmes, etc.)

Treatment : Sterilized, evaporated, homogenized

Modification : Humanized, soft-curd, vitamin-D or lactose-fortified, toned

Article 2

MILK PRODUCTS

2.1 and 2.2 Article 2.1 covers such products as butter, cheese, ghee, cream, dried milk, condensed milk . . . Examples of substances necessary for the manufacturing process of these products are: for *butter*—salt, lactic acid culture, colouring matter . . . ; for *cheese*—salt, spices, coagulating enzymes of animal and vegetable origin . . . ; for *sweetened condensed milk* and *ice-cream*—sugars . . .

2.3 *Examples :*

Type : Whole milk powder . . .
Origin : Cow, goat, sheep, alpine
Intended use : Cooking butter, table butter, coffee cream . . .
Treatment : Sterilized, evaporated, homogenized . . .
Modification : Humanized, vitaminized . . .

Article 3

COMPOSITE PRODUCTS

Examples : Flavoured milks, cheese with added foods, milk porridge, milk bread, milk foods with additives, malted milk, milk chocolate, milk candies, sweetened dried milk, ice-cream . . .

Article 4

OTHER PRODUCTS

The key provision to the whole Article is contained in 4.1. It lays down that no product which is not a product covered by Articles 1, 2 and 3 may be designated, labelled, advertised or presented in any way which might lead the purchaser or consumer to believe that it was such a product. It is clear, therefore, that such designations as cold cream, vanishing cream, face cream, shaving cream, hair cream and milk of magnesia are perfectly acceptable since no confusion is possible.

Article 4.2 deals with the most important category of products covered by 4.1: those which are of such nature as to be likely to lead the purchaser or consumer to suppose that they are products covered by Articles 1, 2 and 3, for example, imitation cream or milk containing non-milk fat. For such products, Article 4.2 states that the general requirements of Article 4.1 as to designations will be presumed to have been fulfilled if their designations conform to one or other of the examples given under (a) and (b). It was believed that the use of those designations would be most likely to ensure the protection of the consumer and the producer of milk and milk products. Examples of designations foreseen: under (a): imitation cream; under (b): soya-milk, coconut milk, almond milk, peanut butter, skimmed milk with non-milk fat. The true nature of milk or milk products used, as foreseen by alternative (b), shall only be described by the term normally used for the milk or milk products in question.

It was further believed in connexion with Article 4.2 that the products margarine and vanaspati were correctly designated by the terms “margarine” and “vanaspati” since no confusion could arise by their use. These products would, however, need to be labelled, advertised and presented in a manner which would not confuse the purchaser or consumer in accordance with Article 4.1.

Article 5

LABELLING, PRESENTATION AND PUBLICITY

This Article is understood to cover the designation of the products referred to.

Article 6

EXTENT OF APPLICATION

As an interim measure, it is understood, however, that a country applying the Code would not be restricted by its provisions when exporting to a country which did not apply the Code. It is evident, nevertheless, that the effect of the Code depends largely on the number of countries applying it. Speedy and wide acceptance would therefore hasten the achievement of the objectives at which it aims.

STANDARDS ADOPTED BY THE COMMITTEE

Standard No. 1

BUTTER

1. *Definitions :*

Butter is a fatty product exclusively derived from milk.

Whey butter is a fatty product derived from whey containing no other fat than milk fat.

2. *Permitted additions :*

Harmless substances necessary for the manufacturing process, for example:

Sodium chloride

Lactic acid cultures

Vegetable colouring matters

3. *Standards :*

Butter and whey butter shall contain not less than 80 % by weight of milk fat and not more than 2 % by weight of milk solids-not-fat. Butter and whey butter shall normally contain not more than 16 % by weight of water. If the water content according to national legislation may exceed 16 % by weight, it must not exceed 18 % by weight.

4. *Marking and labelling :*

Export butter shall be clearly marked with at least the following particulars in letters and figures of a conspicuous size:

(1) indication of the country of manufacture

(2) if the butter contains more than 16 % by weight of water, the words "Contains not more than 18 % of water"

(3) in the case of whey butter, the words "whey butter".

*Standard No. 2*MILK FAT, BUTTER-FAT,
BUTTER-OIL (ANHYDROUS)1. *Designations :*

Milk fat	} (anhydrous)
Butter-fat	
Butter-oil	

2. *Definition :*

Milk fat—butter-fat—butter-oil (anhydrous) is a product exclusively obtained from butter or cream and resulting from the removal of practically the entire water and solids-not-fat content.

3. *Standards :*

The product shall contain:

Not less than 99.3 % of butter-fat

Not more than 0.5 % of water.

Standard No. 3

EVAPORATED MILK

1. *Definition :*

Liquid product obtained by the partial removal of water only from milk or skimmed milk.

2. *Permitted additions :*

Harmless substances which may be necessary for the manufacturing process; for example:

sodium phosphate	} as stabilizers
sodium citrate	
calcium chloride	

3. *Designations and standards :*

- 3.1 Evaporated milk
 Evaporated whole milk
 Evaporated full cream milk
 Unsweetened condensed whole milk
 Unsweetened full cream condensed milk

The product shall contain not less than 7.5 % of fat by weight,
 not less than 25 % of milk solids by weight.

- 3.2 Evaporated skim milk
 Unsweetened condensed skimmed milk

The product shall contain not less than 20 % of milk solids by weight.

Standard No. 4

SWEETENED CONDENSED MILK

1. *Definition :*

Product obtained by the partial removal of water only from milk or skimmed milk with the addition of sugars.

2. *Permitted additions :*

Harmless substances which may be necessary in the manufacturing process.

3. *Designations and standards :*

- 3.1 Sweetened condensed milk
Sweetened condensed whole milk
Sweetened full cream condensed milk

The product shall contain not less than 8 % of fat by weight,
not less than 28 % of milk solids by weight.

- 3.2 Machine-skimmed sweetened condensed milk
Sweetened condensed skimmed milk
Skimmed sweetened condensed milk

The product shall contain not less than 24 % milk solids by weight.

Standard No. 5

WHOLE MILK POWDER, PARTLY SKIMMED MILK POWDER, SKIMMED MILK POWDER

1. *Definition :*

Powder obtained by the removal of water only from milk, partly skimmed milk or skimmed milk.

2. *Permitted additions :*

Harmless substances necessary for the manufacturing process.

3. *Designations and standards :*

- 3.1 Whole milk powder
Dried full cream milk
Full cream milk powder
Dry whole milk
Milk powder
Dried milk

shall contain not less than 26 % of fat by weight and not more than 5 % of water by weight in the product. *

* *Note :* For an interim period ending 1 January 1965, the product may, where in accordance with national legislation already existing on 10 March 1961, contain less than 26% but not less than 24% of fat by weight, provided:

- (a) The product is packed in units of not less than 25 kg.
(b) The product is designated exclusively "milk powder" or "dried milk".
(c) The product is labelled "contains not less than 24% by weight".

3.2 Partly skimmed milk powder

Partly skimmed dried milk

shall contain between 1.5 % and 26 % of fat by weight in the product and not more than 5 % of water by weight in the product. The fat percentage by weight in the product shall be declared.

3.3 Non-fat dry milk

Dried skimmed milk

Skimmed milk powder

shall contain not more than 1.5 % of fat by weight in the product and not more than 5 % of water by weight in the product.

TENTATIVE DRAFT STANDARDS FOR CHEESE

1. *Cheese*

1.1 *Definition :*

“ Cheese ” is the fresh or matured product obtained by draining after coagulation of milk, cream, skimmed or partly skimmed milk, buttermilk or a combination thereof.

1.2 *Cheese designations :*

The terms used to designate the variety of cheeses shall only be applied to those products which conform to the definition of cheese given in paragraph 1.1 and which possess the characteristics normally associated with that variety.

1.3 *Additions :*

The following substances may be added, provided that such substances are not intended to take the place of any milk constituent:

(a) harmless substances which are necessary for the manufacturing process

(b) natural flavouring substances not deriving from milk, such as spices, in such quantity that they can be considered only as flavouring substances, provided that the cheese remains the major constituent and that the addition is declared in the designation of the product (e.g., cheese with celery, etc.), unless the presence of spices is a traditional characteristic of the cheese.

1.4 *Marking and labelling :*

In accordance with Article 5 of the Code of Principles all cheeses shall be marked with their minimum fat content and producing country, whenever the consumer could otherwise be misled. Subject to these requirements, the following provisions shall apply:

1.4.1 *Cheese containing less than 45 % fat :*

Where a cheese contains less than 45 % fat in the dry matter, the guaranteed minimum fat content shall be marked upon all original cheeses, or where not practicable on all original packs, and on all prepared consumer packs.

1.4.2 *Cheese containing 45 % fat or more :*

Where a cheese contains 45 % or more fat in the dry matter, it may be marked with the minimum fat content. Where the designation “ full fat cheese ” is already in use for

cheese with 45 % or more fat in the dry matter, its use may be continued, provided it conforms with the provisions of the Code of Principles.

1.4.3 *Cheeses subject to composition standards :*

The provisions of paragraph 1.4.1 shall, however, not be obligatory in respect of cheese covered by international composition standards set up under the Code of Principles. Until such standards have been elaborated, cheeses covered by existing national legislation, fixing in particular their minimum fat content and maximum moisture content, shall not be subject to the compulsory declaration required by paragraph 1.4.1.*

1.4.4 *General requirements :*

Subject to paragraph 1.4.3 the fat content of cheese shall be expressed as a percentage of the dry matter. The marking of fat content upon the original cheese, original packs and prepared consumer packs shall be made in distinct and legible figures.

1.4.5 *Additional requirements for export :*

The cheese or its package as well as commercial document referring thereto shall bear the name of the producing country and an identification of the manufacturer or exporter in plain or in code.

2. *Whey cheese*

2.1 *Definition :*

Whey cheese is the product obtained by concentration or coagulation of whey, with or without addition of milk and milk fat.

2.2 *Export standards :*

2.2.1 The standard for the content of "whey cheese" is the percentage of fat content in the dry matter.

2.2.2 *Full fat whey cheese :*

The minimum percentage fat in the dry matter in full fat whey cheese shall be 33 %.

2.3 *Marking and labelling :*

2.3.1 The "whey cheese" or "whey cheese packs" shall bear the designation "whey cheese", the name of the producing country and the minimum fat content.

2.3.2 The marking of fat percentage in the dry matter and the designation of "whey cheese" shall be made in distinct and legible figures and letters.

* The Danish delegation put forward the following alternative version of paragraph 1.4.3:

"The provisions of paragraph 1.4.1 are not obligatory for internal trade in respect of cheeses covered by national legislation which:

(a) is already in existence on 10 March 1961,

(b) fixes their minimum fat and maximum moisture contents, and

(c) does not prescribe or prohibits the marking of their minimum fat content in the dry matter."

Annex 2

DEFINITIONS OF AND NOTES ON SOME MILK PRODUCTS *

Toned Milk

Toning can be defined as the addition of reconstituted skim milk to locally produced milk in order to reduce its fat content to a pre-determined standard while maintaining or increasing the content of solids-not-fat.

Soured and Fermented Milks

Broadly speaking, the European traditional methods make use of fresh milk rather than boiled, whereas in Asia the opposite obtains. The modern industrial production of soured and fermented milks in North America, western Europe and other countries has partly taken over and adapted some of the traditional methods and names, as, for example, with yogurt and *kefir*, and partly evolved specific products, such as acidophilus and cultured buttermilk.

Sour milk : milk soured spontaneously by adventitious acid-producing streptococci and lactobacilli when exposed in open pans or vessels for one or two days at room temperature. In Russia and other countries where the milk is popular, it is now prepared for large-scale distribution in catering establishments from pasteurized or boiled milk seeded with pure bacterial cultures.

“ *Long milk* ”: In this characteristic viscous sour dish of Scandinavian countries, bacteria causing “ ripeness ” in milk, usually an annoying form of spoilage, are combined with acid formers to produce a palatable product of remarkable keeping qualities (*långmjölk*, *lättemjök* in Sweden, *taette* in Norway, *pitkäpiimä* in south-western Finland).

Fermentation is induced in fresh milk by the addition of carefully preserved *taette* from an earlier preparation.

The “ cellar milk ” (*kjældermelk*) of Norway is made by establishing in spring the *taette* fermentation in a cellar in huge, carefully cleaned butts and keeping the milk at about 10°C. After a time the milk loses its

* Extracted from: Kon, S. K. (1959) *Milk and milk products in human nutrition*, Rome (FAO Nutritional Studies, No. 17).

viscosity but retains a pleasantly acid flavour and can be kept in a wholesome state for 10 months or even for a year or two.

Yogurt, laban and dahi: Yogurt and yogurt-like products are the traditional form of sour milk of Greece, Romania, Hungary, Bulgaria, Turkey, the Caucasus and neighbouring countries, and often are the main form in which milk is taken. In these countries, cow, goat, sheep or buffalo milk is used as available, mostly whole but in some places skimmed. It is boiled, often for a long time, so that it is reduced in volume, allowed to cool to some 45°C (or to some 52°C for the *laban* variety), inoculated with a starter from the previous day's yogurt and then kept warm until clotted and viscous. When the milk has been concentrated by boiling, the yogurt is usually diluted with water for drinking—for example, the *doogh* or *abdoogh* of Afghanistan and Iran, or *eyran* in Turkey. *Laban* is said to contain a little alcohol from yeast fermentation, but yogurt not more than traces.

In Israel an industrial modification is produced from reconstituted dried skim milk.

Dahi is the sour milk product characteristic of the Indian subcontinent. In the traditional *desi* (or country) method of manufacture, whole milk is brought to the boil, cooled to body temperature, and placed in unglazed earthenware vessels which are kept warm by a wrapping of cloth or hay. Usually a small amount of the previous day's *dahi* is added as a starter, but generally the organisms in the pores of the vessels suffice to start a vigorous fermentation even though the vessels have been washed and dried. *Dahi* is also frequently used as the starting point in the manufacture of ghee, and may then be made from unboiled milk.

Yogurt and *laban* are taken in many ways and form the basis of many staple dishes. In the Mediterranean countries, for long keeping the products are stored in jars under a layer of fat or dried in the sun. The dried product is called *jub-jub* in Lebanon, *kurut* in Afghanistan and *kashg* in Iran.

Another popular dish is made by mixing yogurt and wheat flour, sometimes with the addition of green leaves, allowing the mixture to ferment and then drying it in the sun or shade.

Butter is often made from yogurt or yogurt-like milks by hand-churning. The buttermilk may be taken as such, but the curd is often strained off and dried in the sun or by pressing, as with the whole-milk yogurt.

Cultured yogurt: The name yogurt is also given to the cultured-milk product industrially produced in large quantities in western European and North American countries and also in many other countries with a developed dairy industry. It is usually made from whole milk, either as such or concentrated to two-thirds of its volume, by a highly technical process in which souring is brought about by a combination in equal parts of acid-producing streptococci and lactobacilli.

Kefir : *Kefir* is a sour-milk product of the Caucasus in which lactobacilli and streptococci combine with a lactose-fermenting yeast to give souring and formation of alcohol, of which *kefir* may contain up to 1%. Propagation is by the curious way of adding *kefir* grains to milk. These grains are essentially particles of clotted milk containing the mixed microbial population. *Kefir* is increasingly produced industrially outside the Middle East from pasteurized milk; the *kefir* grains are filtered off after about eight hours, and fermentation is allowed to proceed in bottles for a further day. During fermentation the grains increase in size and thus remove some protein and fat from the milk.

Koumiss : *Koumiss*, which may be regarded as a variety of *kefir*, is the well-known sour alcoholic drink of the peoples in the south-eastern steppes of the European part of the USSR and of western Siberia. It is prepared from mares' milk, which contains more lactose than cows' milk; hence after prolonged fermentation koumiss may contain up to 3% alcohol.

Kurunga : *Kurunga* is a koumiss-like preparation of cows' milk commonly used by peoples in western Soviet Asia.

Chal : *Chal* is a similar effervescent soured product made in Turkmenistan from camels' milk.

Lassi : *Lassi* is the name given to the sour buttermilk remaining after the churning of butter from *dahi* in the manufacture of ghee. *Lassi* is also prepared directly from skim milk in the same way as *dahi* but is a less flavoured and palatable drink than the buttermilk *lassi*.

Buttermilk : The word buttermilk as used earlier denoted the acid by-product of the churning of sour cream into butter, and as such was a popular drink. It is still popular in Belgium, Denmark and Holland.

Cultured buttermilk : Cultured buttermilk is the modern equivalent of sour buttermilk and is now mostly produced by means of a starter of acid-producing streptococci, from skim or partly skimmed milk, pasteurized at a temperature of around 85°C. It is the most popular of the cultured milks in the USA.

Acidophilus milk : *Acidophilus* milk is a similar product made with a pure culture of *Lactobacillus acidophilus*, which has largely replaced *Lactobacillus bulgaricus* for this purpose.

There is no doubt that souring and fermentation have played and are still playing a most important part in making milk safer and more wholesome in many parts of the world where these products are prepared in the traditional fashion. Souring inhibits and later destroys many pathogenic bacteria, particularly typhoid and paratyphoid organisms and noxious

coliforms, so that the outbreaks of intestinal disease so common with untreated milk in hot countries are much less likely with fermented products.

Souring cannot be relied on to control all pathogenic organisms ; for example, *Mycobacterium tuberculosis* and *Brucella melitensis* survive for days if not weeks in fermented milks of quite high acidity.

Traditional Concentrated Milk

In various parts of the world, concentrated milk products are made which in their composition lie on the borderline between the condensed milks of the dairy industry and its dried products. Except for the reindeer product, the following are characteristic of India.

Khoa or *mawa* is obtained by boiling milk while stirring in an open pan over a brisk fire until it reaches the consistency of dough and the water content decreases to some 30%-40%. *Khoa* is usually heavily contaminated with iron from the pan. After manufacture micro-organisms rapidly gain access and the product deteriorates quickly. It should be consumed within not more than four days of manufacture.

Kheer is a similar but less concentrated product, and may be unsweetened or sweetened; if the latter, it resembles sweetened condensed milk in texture.

Rabri is a sweetened concentrated product made by skimming off successive layers of clotted cream from the simmering milk, adding sugar to the liquid residue in the pan when it has been concentrated to about one-eighth of the original volume, and blending into it the skimmed-off clots.

Malai is a similar product made without sugar.

Dried reindeer milk : The Laplanders place reindeer milk in a reindeer's stomach in the heat and smoke over the open fireplace, replenishing it as it evaporates, until after two to three weeks' "cure" the stomach is filled with the dried grainy product. A stomach lasts a Lapp family almost a whole winter. Reindeer intestines are also used for this purpose.

(Butter and Ghee

Butter : In the early years butter was churned directly from milk and still is in India in the *desi* method of ghee-making.

In the modern way, it is as a rule churned either from cream ripened (soured) by starters, or from sweet cream. Those exporting countries such as Denmark and Holland that can deliver the butter rapidly to their customer countries mostly produce the ripened butter, of prized flavour but short shelf-life, whereas in New Zealand, Australia and, to a large extent, in the

USA, sweet-cream butter is made, as it travels better and is less liable to rancidity and other objectionable taints. Apart from these differences, butter may be salted or unsalted.

In the sweet-cream process freshly separated cream is pasteurized and cooled or, alternatively, the cream is neutralized with alkaline compounds such as sodium bicarbonate and subjected to a vacuum heat treatment in which pasteurization and—important in New Zealand and Australia and several other countries—removal of feed taints are achieved simultaneously.

Whether ripened or unripened, the cream is churned by a batch process in large mechanical churns.

Ghee : Ghee, the best known of such stable butter-fat products, is made on a very large scale in India and adjoining countries, and in East Africa. Ghee-making in India is still largely a cottage industry in which butter is churned directly from *dahi* collected over a few days and then heated in batches over a slow fire, at first to come to about 90°C, when the water begins to evaporate, and finally, according to local taste, to about 120°-150°C. The fat is then allowed to solidify by cooling and the lower layer of buttermilk is run out. The ghee produced by the farmers is collected in the refineries and grading stations where the *katcha* (raw) ghee is clarified, whereas the refined ghees are only blended.

Samma is the Egyptian name for ghee ; in some other eastern countries it is called *mislee*.

Dry butter-fat is also produced in other countries by modern technical processes.

Cheese

Cheese may be defined as a solid or semi-solid substance formed from the curd of milk, the liquid part remaining after the separation of the curd being known as whey. Over 400 varieties of cheese and more than 800 names have been listed.

Perhaps in considering its nutritive value cheese might best be divided according to moisture content into very hard, hard, semi-soft and soft types, each of the four types being made from whole or partly skimmed or skim milk; to these may be added the cheeses that are not cheeses in the strict sense—cream cheeses and whey cheese.

The true cheeses of the first three types are all ripened by the action of bacteria or by surface micro-organisms or by blue mould in the interior, whereas the soft cheeses may be ripened or unripened.

Cheeses range, therefore, from almost unchanged milk curd to products markedly altered in moisture content, composition and flavour.

The essential steps in the modern making of *Cheddar*, a typical hard cheese, may be given in the briefest outline as they involve nearly all the

recognized treatments of milk and curd. Milk is usually pasteurized by an HTST process for a very short time, and culture of lactic streptococci is added as a starter, followed by rennet when the desired slight acidity has developed—that is, when the milk has “ripened”. The combination of acidity and enzyme gives the best conditions for the formation of a satisfactory curd. The curd is cut with special knives into small pieces which float in the whey. The temperature is then raised to around blood heat and the mass stirred until the curd reaches a condition suitable for “pitching”, that is, settling at the bottom of the vat. The settled curd is pushed to one end of the vat, the whey drained off and the curd cut and piled to allow further drainage. After a few hours, the curd is milled or ground into small pieces, salt is added and after further standing the curd wrapped in cloth is put into presses in which increasing pressure is applied. When sufficient moisture has drained off the cheese is bandaged in cloth and stored for a few months to ripen.

Differences in various stages of the process give rise to different varieties of cheese—for example, for soft and semi-soft cheeses the curd is not pressed, and in the blue-veined varieties mould either is allowed to penetrate adventitiously into the cracks or is introduced artificially.

Cream cheese is a soft cheese made from renneted or soured cream or a mixture of milk and cream.

Whey cheese is made in various parts of the world by precipitating the soluble proteins of whey by heating (cooking) the acid whey. It is known, for example, as *Ziger* in Germany, *ricotta* and *broccio* in Italy, *recuit* and *sérac* in France. *Skuta* or *puina* is made in Yugoslavia by boiling together sheep's milk whey with one-tenth of sheep's milk. A similar product in Greece is called *mitzithra*. The *mysost* of Scandinavian countries is made by concentrating whey by boiling to about a quarter of the original volume. The mass is stirred while cooking and set in forms.

Processed cheese is made by grinding cheese, adding “melting salts” as stabilizers, and sometimes flavouring, and heating with thorough mixing to about 80°C to soften the mass, which is then poured into suitable containers—cartons, tinfoil or plastic. Processed cheese keeps very well because of the heat treatment.

Channa : *Channa* is the counterpart of cheese made in India and neighbouring countries from boiling milk by the addition of lemon juice, acid whey or sometimes tartaric acid.

The *panir* of Afghanistan is made in a similar fashion.

In the Sherpa areas of the Himalayas and in Tibet surplus *lassi* (buttermilk) is heated, and the clot, mainly consisting of casein, together probably with some precipitated soluble protein, is strained in bamboo baskets;

this wet crude casein, called *chura*, is either air-dried (*churps*) or dried in bamboo baskets near the fireplace (*churkom*).

Skyr : It is of interest to mention the Icelandic *skyr*, in the making of which skim milk is at first heated to near boiling-point for a few minutes and is then set at 40°-45°C with rennet and some ripened *skyr*. The curd separated on the following day forms the *skyr*. It is the main outlet in Iceland for the skim milk from butter-making.

Whey : Whey is the liquid part of the milk remaining after the separation of curd in cheese-making. Where cheese is produced commercially in large quantities it is customary to dry the whey by the roller or spray process as opportunity serves and economics allow. The main outlet for it is in animal feeding.

Annex 3

MILK PASTEURIZATION UNDER BUSH CONDITIONS*

Various methods suitable for the pasteurization of milk under bush conditions have been and are undergoing trial in Kenya.

Mobile All-in-one Milk-Processing Unit

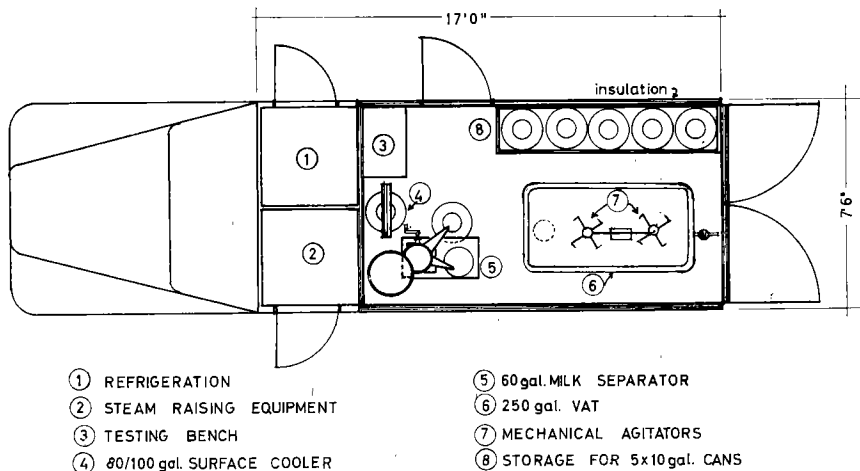
To permit rapid milk collection from smallholders who cannot afford to cool their milk individually, and to pasteurize the milk for distribution in areas where milk plants do not exist, a mobile milk-processing unit fitted to a 5-ton truck is under construction, in consultation with a leading firm of dairy equipment manufacturers in Australia (see Fig. 1). This unit will perform the following duties:

(1) Cool the incoming milk on a surface cooler at a rate of 80-100 gallons (about 360-450 litres) per hour.

(2) Separate milk at a rate of 60 gallons (about 270 litres) per hour.

(3) Store the milk in a tank suitable also for pasteurization and recombining of milk.

FIG. 1
MOBILE ALL-IN-ONE MILK-PROCESSING UNIT



* Contributed by Dr I. Mann, Chief, Animal Industry Projects Section, Department of Veterinary Services, Kabete, Kenya.

The 5-ton insulated truck carries the following equipment:

- (1) Refrigeration
- (2) Steam-raising equipment
- (3) One 80/100-gallon surface cooler
- (4) One 60-gallon milk separator
- (5) One 250-gallon (about 1130-litre) stainless-steel vat for pasteurization, adaptable to milk recombining
- (6) Five 10-gallon (45-litre) cans for cream and skim milk.

The flow of operations is as follows. The smallholder brings his milk to the side door of the truck. Here, organoleptic and clot-on-boiling tests are carried out. The milk which passes the tests is cooled on the surface cooler and tipped into the receiving tank. Milk which is on the point of turning sour is not cooled but separated. The skim milk and the cream are kept separately in five 10-gallon cans on the side of the truck. This skim milk is used either for cheese-making or for culture-milk-making. The cream is cooled on the surface cooler after all milk cooling has been completed. When the receiving tank is full, the steam is turned on and the milk is kept for 30 minutes at 145°F (63°C), after which it is cooled to 45°F (7°C), when it is ready for dispatch.

Whenever local production is not sufficient to cover consumption, the milk pasteurizer is used as a milk recombiner or for the production of liquid skim milk from dried skim milk powder. For this purpose the vat is provided with mechanical agitators. After recombining, the milk is pasteurized.

Continuous-Coil Pasteurizing Plant

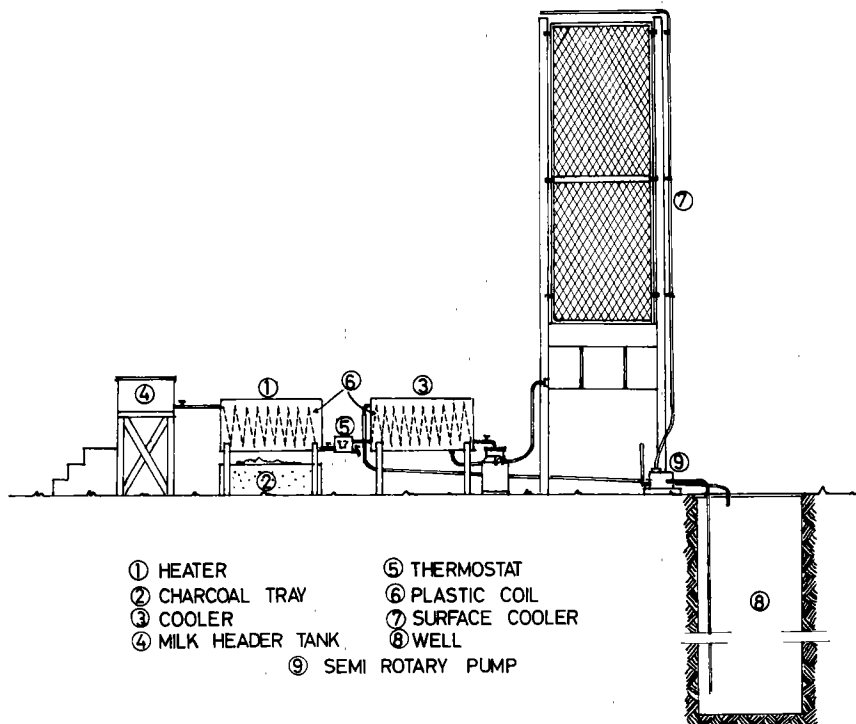
The plant (see Fig. 2) consists of:

(1) A heater, made from a 44-gallon (200-litre) drum, fixed horizontally with a segment, 6 inches (15 cm) deep, cut away along the length of the tank (from the upper surface when horizontal). The water is kept at boiling-point by heating from underneath with a charcoal fire in a half-drum perforated for ash and draught.

(2) A cooler. Cooling takes place in a plastic coil immersed in a 44-gallon drum through which cold water passes continuously. Where ample cold water is available, it is piped direct to the drum; where not available, water has to be stored in a well and fed over a surface cooler by a semi-rotary pump. The cooling water always flows in the opposite direction to the milk flow.

(3) A milk header tank situated above the hot water tank and fitted with a control valve. The milk flows by gravity through the heating coil and then through the cooling coil until it reaches the milk churn.

FIG. 2
CONTINUOUS-COIL PASTEURIZING PLANT



(4) A plastic coil of high-density polythene submerged in the hot water tank, of sufficient length to permit a pasteurizing time of 30 seconds at 165°F (74°C).

(5) A thermostat fitted between the two drums to control the milk flow so that milk which has not reached pasteurizing temperature cannot pass to the cooling drum.

Solar Milk Pasteurizer

In areas where solar radiation is high and fuel scarce, a solar milk pasteurizer is being tried out.¹

The heating unit consists of one 40-gallon (about 180-litre) tank heated by four solar collectors, having a total daily heat output of approximately 15 000 KCal. In sunny weather the heat provided by this unit is far in excess of that required to heat the 40 gallons, but it has been deliberately

¹ The possibility of using methane gas (produced from manure and farm waste) instead of solar energy is also being investigated.

over-powered so that sufficient heat is produced on days when solar radiation is low. The 40-gallon tank is insulated with a minimum of 5 inches (about 13 cm) of fibre glass wool contained in an outer casing.

A stainless-steel coil is immersed in the hot water tank and the milk is passed through the coil, so that it is heated to a temperature of not less than 165° F for 30 seconds. A thermostat valve is fitted in the outlet side of the stainless-steel coil to ensure that only milk that has been heated to the above temperature discharges into a closed receptacle. Cooling is done in the same manner as is described above for the continuous-coil pasteurizer.

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