

Gouda Cheese:

Agricultural Processing Brochure

South African farmers facing current economic realities are searching for new options to maintain and expand their businesses. One of the many opportunities to grow markets, turnover and profits is by adding value to farm produce. Options need to be selected carefully based on sound information and knowledge of the opportunities presenting themselves taking into account the strengths and weaknesses of individual farms.

Introduction:

Product group: Dairy products

Dairy milk is one of the most versatile products available to the processor. Processing options include fermenting, concentrating, drying, freezing and many more methods of preservation. Processed dairy products are divided into five groups:

- Concentrated dairy products
- Cultured dairy products
- Frozen dairy products
- Liquid dairy products
- Powdered dairy products



Gouda is categorised as a *cultured dairy product*.



Product description: Gouda

Cheese is defined as the product obtained from coagulated milk from which the whey has been removed. The coagulum or *curd* has undergone ripening to a greater or lesser extent - between 4 weeks and 12 months, depending on the level of maturity required.

Gouda cheese is categorised as a *cultured dairy product* and is a close-textured, mild, washed-rind

cheese in which the curd may be lightly scalded to retain a higher percentage of lactose and moisture. Gouda is classified as a *semi-hard cheese* and may also be called sweetmilk cheese.

The cheese is dried for a few days before being coated with a yellow coating to prevent it from drying out, then it is aged, during which process the cheese changes from semi-hard to hard.

Dutch cheesemakers generally use six gradations to classify the cheese:

- Young cheese (4 weeks)
- Young matured (8–10 weeks)
- Matured (16–18 weeks)
- Extra matured (7–8 months)
- Old cheese (10–12 months)
- Very old cheese (12 months and more)

Storage of raw milk for processing

Milk is a highly perishable product that may turn sour if left at room temperature. Milk is cooled to improve its quality and stability. Milk leaves the cow at $\pm 37^{\circ}\text{C}$ and must be cooled within 3 hours to 4°C . During cold storage, the milk must be stirred gently to prevent a cream layer from forming on top (cream separation by gravity). Raw milk is thus kept in large vertical tanks at the factory or processing plant, which is fitted with one or more propeller agitator(s) until further processing proceeds.



Milk preparation for the manufacturing of cheese

Clarification of milk

Clarification is the removal of solid impurities (dirt particles, white blood cells and cells of udder tissue) from the milk, prior to further processing. Clarification is achieved through filtration.

Thermisation of milk (optional)

Thermisation is a sub-pasteurisation heat treatment used to treat raw milk at a dairy or processing plant if it cannot be processed immediately. The milk is heated to $60 - 66^{\circ}\text{C}$ for 5 - 20 seconds in a plate heat exchanger. This heat treatment destroys psychotropic bacteria, with the result that milk can be held at 4°C for 2 - 4 days without any significant spoilage organisms growing.

Fast facts:

Fresh milk should be cooled to: **4°C**

Prior to separation the milk is heated to: **$45 - 60^{\circ}\text{C}$**

Pre-heating of milk for separation

Prior to separation the milk is heated to $45 - 60^{\circ}\text{C}$ to ensure effective separation of the skim milk and cream phase. Heating also inactivates the enzyme *lipase* that is responsible for the development of rancidity in fats. Pre-heating guarantees the highest possible cream quality, i.e. the lowest amount of free fat in skim milk.

Separation and standardisation of milk for cheese

Separation: The cream fraction of raw milk is separated from the

skim milk by passing pre-heated raw milk ($45 - 60^{\circ}\text{C}$) through a conventional or hermetic centrifugal separator.

Standardisation follows directly after separation and involves adjusting the fat content of milk to obtain a product with a defined, guaranteed fat content. Cheese is mostly classified according to its fat on dry basis. The **dry matter** in **cheese** contains proteins, butterfat, minerals, and lactose (milk sugar), although little lactose survives fermentation when the cheese is made. A cheese's fat content is expressed

as the percentage of fat in the **cheese's dry matter**, which excludes the cheese's water content

Homogenisation of milk for cheese (optional)

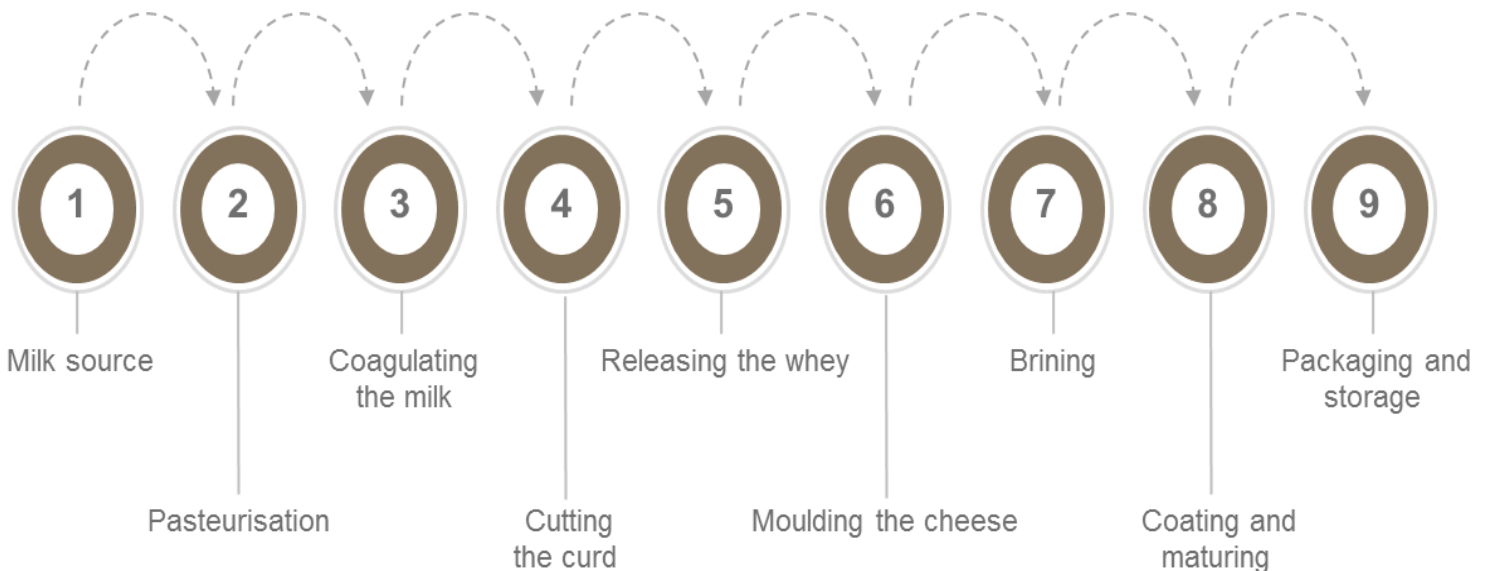
Homogenisation is the process where the fat globules in the milk are finely distributed to prevent fat separation. Homogenisation is accomplished by forcing the milk through a small opening at high velocity to cause disruption of the large fat globules to form small, stable fractions. Homogenisation is most effective when the milk is slightly heated ($60 - 70^{\circ}\text{C}$) and can be done partially or completely.

Gouda cheese process

- 1. Pasteurising the milk:** This kills pathogenic bacteria. The milk is heated to 72 °C, followed by rapid cooling. Pasteurisation is a legal requirement for cheese and helps ensure a safe product.
- 2. Forming the curd:**
 - Bacterial culture is added to the milk in the vat at 29 °C to acidify the milk. The bacterial culture introduces 'good' bacteria, which plays an important role throughout the manufacturing process. The temperature creates ideal conditions for the bacteria to grow, and the acidic environment helps prevent foreign bacterial contamination.
 - Rennet is added to the milk when it reaches a certain pH. This causes casein protein in the milk to coagulate and separate from the liquid whey.
- 3. Cutting the curd:** When the coagulum is firm – it shows a clean break when tested – cutting blades stir through the coagulum to cut it into small pieces. Cutting the curd allows more whey to escape and lowers the moisture content of the final cheese. Gouda is a semi-hard cheese so the curds are cut relatively small compared to softer cheeses to release more moisture.
- 4. Releasing the whey:** When the curds are small enough, which is tested by feeling the curd size in your hands, the cutting attachments are changed for stirring attachments. A large portion of the whey is released from the vat, then hot water is added and the temperature is raised while stirring



Process overview



continuously. Diluting the whey and raising the temperature helps release more whey from the curd.



5. **Moulding:** When the curds are firm enough they are compressed to squeeze out more whey and help them bind together. The compressed curd is marked out, cut into blocks, placed into moulds and pressed.
6. **Brining:** When the moulded cheese has reached the required pH, which is indicated by the cheese becoming more yellow, it is immersed in a brine solution. The salt is absorbed into the cheese. This slows down bacterial growth, contributes to the cheese flavour, helps form a natural rind and inhibits contamination by foreign bacteria.
7. **Coating:** After removing the cheeses from the brine and allowing them to dry overnight, they're coated with 'cheese coat' – a food-grade substance. The function of the coating is to protect the cheese from contamination, while still allowing moisture to evaporate. It also enhances the appearance of the cheese.
8. **Maturing:** The coated cheeses are placed on shelves in a maturing room. The room is maintained at a constant temperature of 16 °C and 80% humidity. This allows the cheeses to ripen – to develop their characteristic flavour and texture. During this time, the cheeses lose moisture and are turned daily to help develop a consistent texture.

Fast facts:

Mature coated cheese at:

Temperature
16 °C

Humidity
80 %

9. **Packaging:** When the cheese has reached the required maturity, it is vacuum packed and placed in cool storage at 4 °C. This slows down the ripening process so the cheese retains its characteristic flavour and also prevents contamination.

Labelling of cheese

Anyone who wants to use the information provided in this document must familiarise him/herself with all the applicable laws that apply to the producing, processing, manufacturing and storage of the products referred

to in this document.

Other processing options – Cultured dairy products

Listed below are other processing options not covered in this report, but available from Eskom.

- **Cheddar cheese** is defined as the product obtained from coagulated milk from which the whey has been removed. The coagulum or curd has undergone ripening to a greater or lesser extent. Cheddar is classified as a high fat, hard cheese.
- **Cheese spread** is a blend of

hard cheese with added emulsifying salts. The mixture undergoes a heat treatment that increases the shelf life. Cheese spread has a relatively high moisture content ($\pm 55\%$) and a pH of 5,7 - 6,3.

- **Cottage cheese** is the product obtained from coagulating milk. It is a soft, not matured cheese and contains about 80% moisture.
- **Cultured (sour) cream** is the product obtained from cream that has been inoculated with a starter culture to allow for the development of lactic acid

and flavour compounds under controlled conditions.

- **Cultured buttermilk** is the product obtained from milk that has been inoculated with a starter culture to produce a viscous liquid with a mild lactic flavour. It is consumed as a refreshing drink or used as an ingredient in various baked products.
- **Drinking yoghurt** is essentially stirred yoghurt with a lower solids content and broken coagulum. It may be pasteurised and/or aseptically packaged to extend the keeping quality.
- **Feta** is a pickled cheese with a clean, acidic salty taste. It is packaged in a brine solution to prevent **drying out and to preserve the cheese**.
- **Kefir** is a smooth, viscous, fermented dairy drink with a fresh acidic taste and contains lactic acid, alcohol ($\pm 1\%$) and gas (carbon dioxide).
- **Long life, set dessert** is a cultured dairy product similar to yoghurt that has undergone a heat process to extend the keeping quality. Set long life dessert is fermented in the final retail container and has a gel-like consistency. It may or may not be flavoured.
- **Long life, stirred dessert** is a cultured dairy product similar to yoghurt that has undergone a heat treatment to extend the keeping quality. Stirred long life dessert is produced in large batches prior to packaging in the final retail container.
- **Maas (cultured milk)** is manufactured by inoculating pasteurised milk with a specific bacterial culture. The end product has a firm texture, no gas bubbles and no separation of whey from the coagulum. It has pleasant sour taste with a slight bite/prickliness on the tongue.
- **Processed cheese** is made from a variety of natural cheeses that are ground and blended together with emulsifying agents. Various other additives may also be added. The mixture is heated and packaged in laminated films.
- **Ricotta** is a cheese prepared from whey. Ricotta is a low fat, soft cheese with a maximum fat in dry matter content of 10% and a minimum dry matter of 20%.
- **Set yoghurt** is prepared from high or full fat pasteurised milk inoculated with a specific starter culture. Fermentation takes place in the final retail container under controlled conditions. The yoghurt has a firm, gel-like consistency and a clean surface is apparent when the yoghurt is cut.
- **Stirred yoghurt** is a fermented milk product with a thick, smooth consistency and may or may not be flavoured. It is incubated in tanks, stirred, flavoured and cooled before packaging.



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