



Theme 8: Food Technology (complete version)

Report of Greece

Cultural & Social Digital documentation Laboratory

by Eleni Liva, Flora Tzelepoglou, Dr. Sotiris Chtouris

November 2011

**ΠΑΝΕΠΙΣΤΗΜΙΟ ΑΙΓΑΙΟΥ
UNIVERSITY OF THE AEGEAN**



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1. ANIMAL HUSBANDRY

Animal husbandry is the agricultural practice of breeding and raising livestock, practiced for thousands of years, since the Neolithic Age. In Greece, animal farming mainly involves sheep and goats. According to data provided by the National Statistics Service, Greek animal farmers rear approximately 14.000.000 sheep and goats mainly for milk production.

Greece ranks seventh in global goat milk production (5, 2%) and second among European Union countries (28, 1% of total goat milk production in the EU). Greece also raises 47, 7% of goats in the EU. These two sectors of animal production (sheep and goat) are of paramount importance not only for economic reasons, but because they also have social repercussions, especially in mountainous and hilly regions of Greece, as they help sustain the social fabric of local societies.

In Greece, pasture land is the most extensive natural land resource with tremendous economic and environmental value. It involves a surface of approximately 53 million hectares or 44% of total land surface. In general, designated pasture lands in our country are characterized by a great variety, either in relation to terrain or altitude, or vegetation and productivity.

Given the large number of sheep ((9.300.000) and goats (5.500.000) that graze in pastures and grasslands, it is quite evident that grazing burdens herbaceous and shrubby ecosystems alike. Consequently, given the above mentioned animal population in relation to the aforementioned surface of available forage material and its relatively low nutritional value, one can assume that animals can only subsist for a few months time without damaging the pastures with overgrazing. However, in practice, animal flocks are kept in pastures all year long, weather permitting, that is why there is the phenomenon of over-grazing; indeed, pasture lands are being constantly downgraded in terms of biodiversity and productivity.

Nowadays, nomadic pastoralism faces a lot of difficulties, that is why it is being gradually abandoned in favour of intensive animal farming. At the same time, strong objections have been proclaimed by scientists and environmentalists, on the issue of free and unrestricted grazing. Consequently, intensive farming is gaining more and more ground, thus eliminating seasonal flock movement. Moreover, another advantage is that animal feed is better controlled, in order to assure its nutritional value and veterinary doctors have more opportunities to perform periodical health checks on the animals. Breeding centers are relatively close to urban centers (as opposed to nomadic pastoralism) and this facilitates transportation and marketing of dairy products. In spite of the fact that in both animal husbandry and farming there is a reduction in the number of active farmers, overall production has increased. Mechanization of production is the main reason, as it makes farming and animal husbandry less labour intensive.

2. MILK PRODUCTION AND HARVESTING

Traditionally, animal farming is a centuries old activity that has retained a lot of its original characteristics, nowadays, the only real difference being that milk processing does not take place next to the sheep barn but in specially designed dairy plants. However, traditional cheese- making methods are still preserved, but in a modern context of health and security standards, as they have been established by EU

legislation. Milking is done either manually or with a milking machine. If it is done manually then the number of animals that a farmer can milk cannot surpass 70 – 100 per hour. On the contrary, when a milking machine is used then numbers exceed 150 animals per hour, while milk is of better quality, provided of course that standards are respected. Milking machines can easily be installed in mountainous animal farms, so that animal breeders can cope better with bigger flocks and a dwindling available labour force. Naturally, their living conditions benefit considerably from the mechanization of production and the fact that produced milk is of better quality, complying with all standards, is an added value. Indeed, harvested milk does not come into contact with human hands, as it is automatically transported to special storage vats.

Cheese production has been proven an efficient way of milk exploitation from indigenous small ruminants' breeds, since ancient times. It is well known that ewe's milk is the most appropriate kind of milk for cheese making, due to its high casein and fat content. This is especially true for indigenous ewe breeds. Also the composition of goat's milk from indigenous Greek breeds has a remarkable high fat and casein content. In fact, most of Greek cheese varieties are produced from mixtures of ewe's and goat's milk, the latter representing about 20-30% of the cheese/milk mixture.

In Greece, the production of milk and dairy food is of major economic importance, although the quantities of milk originating from ewes and goats are highly seasonal (6-8 months per year), 3-4.5kg/day for goats and 1-2kg/day for sheep.

In 2008, about 1.890.000t of milk were produced in the country, 37% of which from ewes and 22% from goats. Therefore, annual small ruminants' milk production is more than 100 kilos per habitant, derived mainly from autochthonous breeds of animals. Apart from liquid milk for human consumption, the most important dairy products produced in the country are yogurt and cheese. In fact, more than 80% of small ruminants' milk is used for cheese production. **The 2/3 of total cheese production, estimated to be about 185.000t in 2008, were made from ewe's or goat's milk, and about 50% was Feta cheese.**

3. CHEESE MANUFACTURING: Mythology and History

Cheese-making in Greece is an ancient tradition. Diodorus Sicilius (1st century BC), the Greek historian from Sicily, wrote that Aristeus, son of Apollo and grandson of Zeus, who had learnt the art of cheese-making from his nannies, the nymphs, was sent by the gods to Olympus mountain to teach the Greeks how to make cheese. Given the value of cheese as a staple food, it is not surprising that ancient Greeks considered cheese as a divine invention and gift to the humans.

The first documented evidence of milk consumption goes back to 5400BC, as it was shown by chemical analysis of Prehistoric jars, in Central Macedonia, containing food remains. It is the oldest recorded milk use that has been found on the European territory. The Greek word for cheese, *tyros* appears on Mycenaean Linear B inscriptions in the ancient palace of Pylos, circa 1200BC, and it refers to a ceremonial banquet offered in honour of the god Poseidon. The first written evidence we have on cheese and milk products is in the Homeric epic poems, more specifically in the Iliad (Rhapsody Λ: 637-641), where there is mention of a slave offering dry cheese to Patroclus, and in Odyssey (Rhapsody I: 216-249), where Homer describes succinctly Polyphemus, a shepherd and a cheese maker of the 12th century BC, giving a full description of the cheese-making process of that time, which archaeological excavations have proved to be in practice all over the Aegean islands. In Ancient

Greece there were products similar to yogurt, for example the ‘*pyriati*’ (a kind of buttermilk) and the “*oxygala*”, which, after it was strained three times, was salted and then sealed in containers to solidify. Cheese, however, was the most important milk product, from either ewe or goat milk. They would use the enzyme rennet (from a lamb’s or goat’s stomach) or fig juice and then they would seal it in clay pots. Fresh cheese was strained in woven wicker baskets, a technique still used in the Aegean islands. Dairy products were the staple food for Byzantines of all social classes. There are references of “*asvestotyri*” (a cheap low quality cheese), as well as the exquisite “*tyrepsitos zomos*” that was served in official banquets offered by the Orthodox Patriarch or the Byzantine Emperor. During medieval times the contribution of monasteries (as self sufficient communities) was very important in developing further cheese-making techniques and new cheese varieties. Nowadays, sheep and goat sheds are found all over the Aegean islands, from North Aegean to Crete, in the south. They are given different names, according to local dialects, but in terms of organoleptic characteristics they present a lot of similarities.



Metato in Crete



Huts (“*konaki*”) of nomadic Sarakatsani (Representation), at Gyftokambos, *Epirus*

A characteristic example is the Cretan *metato* (in Byzantine times the term was used in the sense of provisional shelter and it continues to have the same meaning in Crete), a combination of seasonal dwelling and barn, where milk production would take place in situ. On the Nida plateau, on the high mountain of Psiloritis, there are several such buildings, with dry stone walls and dome, testimonies of an ancient building tradition.

Most researchers agree that there are marked morphological and construction similarities among prehistoric dwellings and both the Cretan ‘*metato*’ and the Sarakatsani ‘*konaki*’. It is, however, the nomadic shepherd people, such as the Sarakatsani and the Vlachs, who preserved their nomadic and semi nomadic life, thus organizing rural space and life throughout the Greek countryside, from prehistoric times till today. Since time immemorial, pastoralists lived on the Pindos mountain range, moving all year through, during summer towards mountain pastures and during winter to lowlands. The Sarakatsani hut was called “*konaki*” and its building materials were straw and wood; inside the hut there was a special space for milk processing and cheese production: it was called “*batzario*” because of the cheese they produced called “*batzos*”.



Batzario in a Sarakatsani konaki (Representation)



Young girl making batzos cheese (late 19th century) at Gyftokambos, Epirus

4. CHEESE-MAKING TECHNIQUES: Traditional, contemporary

4.1 Traditional framework

Technology is an integral part of the relationship between society and natural environment. More specifically, the way a community is organized reflects its perception of the natural environment and, at the same time, defines the survival techniques that will be developed. The very cheese-making process has undergone a series of changes through times that clearly reflect historic, economic and social transformation of the producing community.

Traditionally, in contemporary Greece, cheese-making started right after the religious festival of St George, on April 23d, a date that coincided with the settlement of the semi nomadic flocks around the summer pastures. Cheese-making continued intensively till July 20th, since after that date milk production was reduced significantly. Evangelos Karamanes, in his thorough study about space organization and local identity in the Kopatsarika villages, in Epirus, describes the overall production system: They had established an elaborate and rational system, namely aggregation of small flocks so that production and commercialization of produce would be more efficient, while, at the same time, every producer knew exactly how much milk he was entitled to produce. Each pastoral settlement (called “*strounga*”) would hire a cheese-maker, an individual of general acceptance and trust, who knew all the secrets of his craft, taking care of the dairy production that were so important for their everyday diet. Moreover, dairy products were basic exchange products and their main income source.

The utensils used for cheese-making were wooden; they would be cleaned with hot water and sterilized under the sun. Cheese was stored in “*touloumia*”, that is goat skin sacs containing up to 50 kilos of cheese, or in small barrels. The most important dairy product of each *strounga* was the ‘*batzos*’ (Fig.1), a cheese produced from non pasteurized sheep or goat milk, or a mix of the two. After milking the animals they would gather the milk in a bucket, filtering it through a linen cheese cloth. Then they would add rennet enzyme from the stomach of an unweaned (suckling) goat kid in order to curdle the milk. As soon as the milk started curdling the cheese-maker would begin stirring continuously with some intermediary pauses. Following the stirring process a large part of the butter became separated from the curd and remained in the whey. Thus, the ‘*batzos*’ cheese having been effectively separated from the whey, was then put in a cheese cloth, tightly tied around the cheese, so that further whey would be shed from the ‘*batzos*’; finally, it would be hung from the wooden ceiling beams of the ‘*batzario*’ for 24 hours. Next day they would cut the ‘*batzos*’ into slices and put it

into containers filled with brine. Usually the *batzos* was sold right away, or was marketed in nearby open markets, bazaars, inside goat skin sacs. Nowadays, in several mountainous regions of Greece, there are a lot of small dairy farms operating at small scale, 50 – 100 kilos milk per day, with quite simple equipment: common scales to weigh the milk containers, cheese cloth sieves, boilers heated with firewood, wooden moulds, barrels etc.

4.2 Contemporary framework

There are some historic facts, of paramount importance for Greece as a whole, that brought deep and lasting changes to pastoralism, such as the 2nd World War, the Civil War (1946-49), as well as massive immigration of Greeks to North European countries – mainly Germany - and other destinations during the '60s. Gradually, there was a trend of animal farmers relocating to lowland villages and settling there, abandoning their nomadic life. During the '50s cheese merchants started buying milk from producers, and it was them who undertook the cheese making process. This had a devastating effect on the traditional production organization of small animal farmers, as the whole cheese making process changed hands. After the '70s animal farmers started using tracks to transport their flocks to their winter villages. Old memories of thousands of animals running through traditional pastoral routes started to fade away.

Lately, the EU supports local products and traditional technologies. “Typical” foods are considered as safer and healthier by the consumer and “typicality” has been established as a recent way to recognize the quality of a product.

Numerous traditional cheeses are made throughout Greece today. Some of them are in fact types of the same variety, they have somewhat different steps in technology or possibly the same technology, but are known under different local names. Twenty of them have been recognized as PDO (Protected Designation of Origin) cheeses and there are others about to be recognized as such. Once a product has been acknowledged as PDO, then no one can give another product even a similar name as the one of the protected traditional product. In order to acknowledge a product as Protected Designation of Origin, it must meet the following conditions:

- A. It must be produced and ripened within a strictly defined geographical area.
- B. Its raw material must be also produced within the same geographical area.
- C. No chemical additives are used in its production.
- D. It is produced using traditional techniques under natural conditions.

Greece is third in place in terms of the number of cheeses, thus proving its long cheese-making tradition. Goat and sheep rearing has greatly developed in contrast with Central and Northern Europe. Greek PDO cheeses are:

Anevato, Batzos, Feta, Formaella Arachovas, Galotyri, Graviera Agrafon, Graviera Kritis, Graviera Naxou, Kalathaki Limnou, Kasseri, Katiki Domokou, Kefalograviera, Kopanisti, Ladotyri Mytilinis, Manouri, Metsovone, Pichtogalo Chanion, San Michali, Sfela or Fire Feta, Xynomyzithra Kritis. All Greek cheeses are traditionally produced, with fresh milk. This milk is mainly ewe milk containing up to 20% of goat milk. Cow milk is not used often; only two of the PDO chesses are made from cow milk: Graviera Naxou and San Michali. Metsovone is made from a mixture of sheep and cow milk.

The fact is that sheep and goat rearing is much easier in Greece because of the uneven and mountainous terrain that does not favor cow rearing. As a total, Greek traditional cheeses could be grouped, according to their technology of manufacture as: **hard** cheeses, **semi-hard** cheeses, cheeses **in brine**, **soft** cheeses and **whey** cheeses.

5. GREEK TRADITIONAL CHEESES

Milk being the raw material for making cheese, it is considered as the “soul” of the cheese. Indeed, milk is the decisive factor that will define cheese quality altogether. Cheese makers have to take into consideration the following elements: the animal’s breed, the milk producing stage, the milking technique, the climate, the season of the year, as well as the animal’s overall health. Cheese is produced by coagulation of the milk protein casein. Typically, the milk is acidified and addition of the rennet enzyme causes coagulation. The solids are separated and pressed into final form.

5.1 Hard Cheeses

5.1.1 Kefalotyri (*kefali + tyri = head + cheese*) is a generic name given to all kinds of hard yellow cheese made from ewe’s or goat’s milk or a mixture of both.

Depending on its geographical origin it has different shape, size, production technique and quality; thus we have *kefalotyri* from Epirus, Macedonia, Thrace, Crete, Evia, Cephalonia etc. *Kefalotyri* made of ewe’s milk is of better quality; when goat’s milk is added, up to 20%, its texture becomes harder but it can be preserved for longer time. *Kefalotyri* is characterized by its high hardness, salty taste and strong flavor. It is used mainly in cooking, as grated cheese. Recently there are some *kefalotyri* variations that can be offered as table cheese.

This cheese technology was introduced from Italy to Greece centuries ago. It is manufactured in various parts of Greece with technologies that differ from area to area and it is traded under the name of the region where it is manufactured (Crete, Naxos, Thessaly, Cephalonia, Epirus, etc).

Traditionally, *kefalotyri* was made from non pasteurized milk that was curdled in the dairy, right after milking, when it was still warm and needed no extra heating.

Nowadays, it is made of skimmed milk which is usually pasteurized. Starter cultures are added in the cheese milk. After coagulation, the coagulum is cut into small particles. The temperature is then raised to 43-45° C under continuous stirring. The coagulum is cut into pieces the size of the mould. These pieces are put into moulds and they are then put into press. The cheese is placed in the ripening room for 24 hours and then in brine for two days. It is transferred again in the maturing room where it is given 20 days dry saltings. The cheese is finally washed in brine and transferred into a cold store to continue maturing (*Fig.2*).

5.1.2 Graviera is the finest cheese among Greek hard cheeses. It is distinguished for its pleasant aroma and its fine taste. Ewe’s milk is mainly used for cheese manufacturing, but cow’s milk or mixtures of it with ewe and goat milk are also used, the latter not exceeding 20%. The mature cheese has a smear rind and usually exhibits small or larger irregular openings (“eye-holes”). Initially, the Greek *Graviera* started to be manufactured during the second decade of the 20th century. Nowadays, many types of *Graviera* are traded and are distinguished from the name of the geographical region where they are produced (*Graviera* of Crete, Naxos, Mytilini, Tinos, Lamia, Kerkyra, Larissa, Dodoni etc.). The milk is renneted at 33-36° C with a quantity of

rennet able to curdle the milk within 25 min. The use of starter is optional. The curd is cut in small pieces, the size of corn and cooked at 48-50°C under continuous stirring. The curd is cut into pieces, each one enough to fill one mould. The cheese in the mould is pressed for 24 hours. After pressing, the cheese is put on shelves in the salting rooms (14-16°C) where it is surface-salted by 40-60 saltings, depending on the cheese height.

Traditionally, the Greek *Graviera* required no addition of starter culture. However, since milk pasteurization became obligatory, in order to eliminate bacteria, the addition of culture was established as a norm.

Nevertheless, there are a lot of cheese-makers, especially in Crete, who add a quantity of fresh, non pasteurized milk to the already pasteurized milk, making sure that this milk comes from perfectly healthy animals under hygienic conditions. The ratio is 50-70 kilos of fresh milk to a quantity of 1000 kilos of pasteurized milk. This greatly assists the *Graviera*'s ripening process and the formation of "eye holes". As far as the size of each cheese head is concerned, the cheese maker will decide taking into consideration different parameters: For instance, small sized cheese heads absorb salt more quickly, as their surface is bigger in relation to their volume, in comparison to bigger cheese heads. Normally, each *Graviera* head weighs 10 to 12 kilos, its height is 14cm and its diameter 40cm. The cheese ripens for 3-4 months. Nowadays, cheese milk is pasteurized and starter (sometimes fresh yogurt) is used for cheese manufacture in modern dairies. (Fig.3)

5.1.3 Ladotyri is a hard cheese, produced mainly on the island of Lesbos (North Aegean). This cheese is made from sheep or mixture of sheep and goat's milk raw at home or pasteurized in dairies. The Mytilini *Ladotyri* is preserved in olive oil, as indicated by its name (ladi=oil, tyri=cheese). (Fig.4)

5.2 Semi-hard Cheeses

5.2.1 Kasserì is a traditional Greek cheese of "pasta filata" type (Italian definition meaning an elastic cheese mass), with a pleasant flavor, manufactured from sheep milk or mixtures of sheep and goat milk. This cheese was introduced to Greece from the neighboring Balkan counties at the end of the 19th century, initially to Thessaly - Central Greece- and later its manufacture was spread to other areas of the country. Traditionally, the *kasserì* cheese was made from non pasteurized sheep milk mixed with goat or cow milk. Nowadays, cheese makers use pasteurized milk and it is curdled at 32°C, the coagulum is cut and is usually cooked at 38°C. The curd is cut in large pieces, and the "*baski*" is left to drain in a cheese cloth and ripen over a period of 8-24 hours at 18-20°C. The ripened "*baski*" is then cut into small thin uniform slices, which are put into a basket. The basket is dipped into water (at 70°C), where it is turned in such a way to facilitate the penetration of water between the slices. Thus, the cheese becomes soft, elastic and its uniformity is achieved by its thorough stirring with a wooden ladle. Then the cheese is cut into pieces, in the shape of balls, and is introduced into the moulds, where it remains for 2-4 days. Then the *kasserì* is salted every 2-3 days, until it accepts 12-14 saltings. The ripening in the warm room (18°C) lasts for at least 70 days. It is then transferred to cold storage places (0-2°C). The *kasserì* mould is smaller than the *kefalotyri*. (Fig.5)

Cheeses in brine

By the term “brined cheeses” we describe the group of cheese varieties ripened and preserved in brine for a considerable amount of time, i.e. until consumption. They are traditionally produced under various names in the Balkan and Eastern Mediterranean countries.

5.3.1 Batzos is a low-fat, semi-hard, white brined cheese with a sourish and lightly piquant taste and a large number of “holes” in the body. It is made either of goat or sheep milk or a mixture of both. This cheese is made at home using a traditional method, as well as at dairies of Western and Central Macedonia and Thessaly, using modified manufacturing methods and technological innovations. The unique feature of its manufacture is the cutting of the curd into very small pieces as soon as coagulation occurs. Then the manufacturer “hits” the curd with a thick wooden stick about 150-200 times. This manipulation aims to the production of whey with high fat content for *Manouri* production. After scalding the curd/whey mixture to 42-45° C, the curd granules are collected with cheese cloths and hanged to drain for 24 hours. The drained curd is left at 16-18° C for 2 days until the appearance of gas holes. Then it is cut into pieces and dry salted. The next day the cheese pieces are packed in metal containers filled with brine and kept in cold storage places for at least 3 months.

(Fig.1)

5.3.2 Feta is the most important cheese variety produced in Greece in terms of both production and consumer acceptance. It is worldwide known and very popular, and it has been registered as a PDO by a European Commission Regulation (2002). It is made of ewe’s milk or from its mixtures with goat’s milk, in which the latter must not exceed 30% of the total cheese milk. The cheese milk must be produced exclusively in the geographic areas of Macedonia, Thrace, Epirus, Thessaly, Sterea Hellas, Peloponnese and Lesvos Island. Cheese making technology is based on the traditional method.

Feta is a semi-soft, white brined cheese with a mild rancid and slightly acid taste, as well as firm and smooth texture. No gas holes should be present, but irregular small mechanical openings are desirable. The coagulation of milk is traditionally made by rennet enzyme. After curdling, the curd is cut and transferred into either cheese cloths or perforated moulds for draining without pressing. The drained curd is subsequently cut into blocks and salted by coarse salt on cheese-tables, until it contains 3-3.5% salt. The cheese remains on the cheese-tables for 15 days. During this period a surface micro flora is developed which is considered to contribute to cheese ripening and flavor. The cheese is afterwards transferred into barrels or tins with brine to continue ripening in cold rooms.

Feta is the oldest kind of cheese that exists in Greece. Recent data show an annual domestic consumption of over 20kg of feta cheese per capita. During the period between 1990 and 1995, Greece was steadily exporting more than 7000 tons of feta cheese per year.

Modern technology follows the traditional steps of feta making in standardized conditions. The whole process is fully automated so that feta is competitive in a global market. (Fig.6)

5.3.3 Kalathaki of Limnos is very similar to the Feta cheese variety in terms of manufacturing and characteristics. Its special feature is that draining and acidification of the curd takes place in special cylindrical moulds that are like baskets (in the old times made of wicker or reeds, nowadays they are made of plastic) that give this cheese its shape and a characteristic embossed surface. It is also surface salted. It is

produced on the island of Lemnos (North Aegean) in small quantities. This cheese's biochemical characteristics are similar to those of the Feta cheese. (Fig.7)

5.3.4 Sfela (Feta of fire) is a cheese produced in southern Greece (southern Peloponnese), particularly in the Messinia province. It is a semi-hard rindless cheese with many small holes, which is ripened in brine, either in wooden barrels or in tins, for at least 3 months. The cheese is manufactured from either ewe's or goat's milk or a mixture of them. Raw or pasteurized whole milk is coagulated at 30-32° C using traditional rennet. After 40 min the curd is cut into pieces similar to a grain of rice, stirred continuously, and scalded slowly to 38-40° C (this is the reason why it is called *feta of fire*). Curd pieces are collected using a cheese cloth and then are pressed. The pressed curd is cut into stripes, 4-7cm wide, it is dry salted for 24 hours at room temperature before transfer to barrels or tins containing brine and stored at room temperature for one month. (Fig.8)

5.4 Soft Cheeses

5.4.1 Anevato is a spread type of cheese made from raw sheep or goat milk or a mixture of both. This traditional cheese has a pleasant taste, especially when it is made from goat milk. It can be produced at home as well as in dairies on the mountain region of Western Macedonia in north west Greece and in nearby Thessaly. Traditionally, *Anevato* cheese was produced in Western Macedonia by shepherds with large flocks of goats and sheep. The renneted milk was obtained in the morning just before taking the flock out for feeding. During the day the curd was "raised" and was ready to be drained on their return late in the afternoon. Shepherds used to visit their villages once a week to see their families and sell their cheeses. (Fig.9)

5.4.2 Galotyri is a soft cheese with sourish taste, made from sheep milk at the end of the lactation season. This cheese is made all over the country although the cheese making process differs from region to region. The milk is boiled and put in a clay pot and after 24 hours it is salted and left for another two days. During this time the milk is stirred every 3 hours. It is then transferred to a skin bag. This is repeated several times until the bag is filled. The cheese ripens for 3 months. Nowadays, the *Galotyri* usually ripens in barrels instead of goat skins bags. In this case, in order to avoid the growth of moulds, the cheese surface is covered with melted fat. (Fig.10)

5.4.3 Xinotyri is a farm cheese variety, manufactured from raw goat's milk from indigenous breeds in the island of Naxos in the Cyclades complex. (Fig.11)

5.5 Whey cheeses

The well established method of whey utilization, however partial in Greece, involves the recovery of whey proteins together with some fat remaining in the whey in order to produce whey cheese. The manufacturing process for whey cheeses includes enrichment of the whey with milk and/or cream, depending on the quality and the characteristics of the desired end-product. For *Manouri* cream and milk are usually added, while for *Myzithra*, milk is occasionally added.

5.5.1 Myzithra is a traditional Greek whey cheese made by heating the whey at a temperature of 88-92 C, with a fat content of up to 19%. The whey is heated under continuous stirring to obtain a temperature of 88-92° C within 45 min. For a better quality of *Myzithra*, whole milk is added to the whey, in a proportion of 3-5%. Salt

may also be added to the whey while it is heated. *Myzithra* is used as a table cheese but more commonly as an ingredient of certain foods (namely cheese pies). It is also encountered in a partially dehydrated form, called dry *myzithra*, used for grating. (Fig.12)

5.5.2 *Xinomyzithra* is a type of *myzithra* which is made from the whey obtained during the production of *Kefalotyri* and *Graviera* from sheep and goat milk. It is a traditional product of Crete Island. For the production of *Xinomyzithra*, first *Myzithra* is manufactured, which is cooked and drained more vigorously, then pressed for one week. Salt is added and the cheese is stored in barrels to ripen for a period of 2 months. (Fig.13)

5.5.3 *Manouri* is a whey cheese that has many similarities to the *myzithra*, but it is creamier and less salty, with a delicate texture and superior sensory quality. *Manouri* is a traditional product of Western Macedonia, in northern Greece, and it has long been made from whey obtained during the production of *batzos*, a semi-hard cheese from sheep and goat milk. Today *manouri* is also produced from whey of cheeses made solely from sheep milk, and although a whey cheese, it is the main product of this cheese making process. (Fig.14)

6. SHEEP/GOAT YOGURT

The birth of yogurt goes back to the Neolithic Age, in the Middle East region, where there were a lot of sheep and goat herds grazing under high temperatures. Eventually, at some point the excess milk, by itself, turned into a solid cream and the miracle of yogurt was born! Mediterranean people learned a lot about cheese and yogurt making from their contacts with the nomadic shepherds that roamed into the region. As a result they had a product that met the need for longer preservation periods, since there were no cooling devices available at the time; moreover it addressed the problem of uneven distribution of milk production over the year.

Yogurt is one of the most important dairy products and it is produced by bacterial fermentation of milk. In the '50s animal farmers living in villages around Athens would make their own yogurt in big cauldrons in their home yards and they would sell it in stalls alongside the main road. The traditional way of yogurt making is time consuming but very effective. After boiling and stirring the milk they pour it in small separate clay pots and then yeast (from a previous batch of yogurt) is added, one by one, so that it thickens independently. By contrast, in mass industrial production yeast is added to the large milk vats, where it coagulates and then is distributed to small pots. If no preservatives are added, the yogurt can be preserved for 8-12 days.

In 2008, about 138.000 tons of yogurt were produced, 20% of which were yogurt-type products. Indeed, today we can find a big variety of yogurts: 1) Probiotic yogurts that contain a higher percentage of live bacteria and are considered more healthy 2) Organic yogurts made of cow's or sheep's milk (reared organically) 3) Children's yogurts fortified with vitamins, minerals and trace elements 4) Yogurts fortified with vitamins, minerals, trace elements, micronutrients and ω -3 fat acids for people with special dietary needs 5) Yogurt deserts that contain dry fruit, fruit, honey, biscuits, cereals or chocolate chips 6) Sheep yogurt from sheep milk containing up to 7% fat usually produced by conventional dairies 7) Plain cow's yogurt made from skimmed, semi skimmed or whole fresh cow milk 8) Strained cow's yogurt that represents the majority of yogurts. It is called 'strained' because part of the milk's water is strained

and as a result the yogurt's texture is thick and creamy 9) Traditional yogurt is the one with the skin (*petsa*). This skin is produced because the milk is not homogenized.

7. GOAT BUTTER: The Cretan 'staka' butter

Animal farming in Crete is based mainly on free range sheep and goats that graze on local plants, herbs and shrubbery. The unique characteristics of the Cretan flora, in conjunction with local animal breeds, contribute to the production of dairy products with special characteristics. The "staka" butter ("*stakovoutyro*") is the Cretan milk butter made from sheep or goat milk.

Process of production:

Raw or boiled goat's milk is placed in shallow basins and left for 24 hours to create a cream. The cream is collected and put in clay vessels. The same is done for the next successive milkings. Some salt is added and then the cream is left for some days to increase its acidity. Then it is boiled, the milk fat is separated, and finally collected in bottles of 500gr or 1kg. Staka butter is produced in farms by shepherds, mainly for their own consumption. It is also sold at the local market in bottles. When used in cooking it replaces normal butter.

8. TRAINING IN DAIRY

In the city of Ioannina (Epirus) there is a Vocational Training School, under the auspices of the Ministry of Rural Development and Food, where students become specialists in "Dairy products and Cheese-making". This School was first established in 1916 by the agronomist Nikos Zygouris, from Ioannina, who brought the "Graviera" cheese in Greece. It is a two-year course, with 160 students attending every year. There is also a boarding school that provides free housing and food for those who need it. Priority is given to those students who originate from mountainous or border regions and wish to work as professionals in the dairy industry or open their own dairy farm.

CONCLUSION

The main characteristic of the Greek dairy production, since ancient times, has been the significant production of sheep and goat milk, as well as the exceptional quality of cheese products. In Greece, there are approximately 250.000 families who are active as animal farmers or work in the processing sector. Thus, the sheep and goat sector is rightly considered as the 'backbone' of Greek animal farming. There is a host of factors that contribute to this effect, namely the land's relief, low annual rainfall, mild temperatures, as well as scarcity of arable lands, as a result of which mountainous and hilly areas are ideal for raising sheep and goats. These animal farms are small sized, dispersed on the mountains and on hilly areas of the land, the animals being resilient, small sized and well adapted to the local climate, with low milk productivity. These domestic breeds produce milk with distinctive characteristics, namely milk rich in protein and fat content that gives high yields for cheese production. However, the main bulk of the Greek sheep and goat sector is destined for milk production. Today, there are large scale dairy plants in Peloponnesus, Crete, Sterea Hellas, Epirus, as well as Central and Eastern Macedonia. In these regions dairy plants use the latest technology available for milk processing and dairy production (namely, milking machines, mechanical pumps, automated cheese machines, conveyor belts to deliver curd to cold water, stainless steel moulds, mechanical press, coolers etc).

According to the Ministry of Rural Development and Food, in 2002, 70% of sheep milk and 50% of goat milk respectively were harvested to be delivered to dairy plants for processing. Production is on the increase for most of the dairy products. Indicatively, the 2002 production consisted of 461.700 t of milk. Out of this amount, dairy plants manufactured 105.000t of yogurt, 1.800t of butter, as well as a range of dairy products (such as condensed milk, creams, fruit milk etc.) and 162.000t of cheese. It is quite evident that cheese production is one of the main characteristics of the Greek dairy industry, the majority being made from sheep and goat milk. In Greece, a wide range of cheese types evolved through the centuries, so that nowadays each area, almost every island, has its individual unique tradition in cheese-making. It is quite possible that the cheese described by Homer is the ancestor of Feta and it has been the most popular cheese manufactured in Greece from ancient times till today. Indeed, the Greek Feta cheese has been recognized as a significant cultural heritage.

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<http://www.anogialand.gr>

iliochori@gmail.com

<http://www.minagric.gr>

Photographs

Fig.1



Cheese in brine: Batzos

Fig.2



Hard cheese: Kefalotyri

Fig.3



Hard cheese: Graviera

Fig.4



Hard cheese: Ladotyri



Ladotyri preserved in olive oil

Fig. 5



Semi hard cheese: Kasseri

Fig. 6



Cheese in brine: Feta



Fig.7



Cheese in brine: Kalathaki of Limnos

Fig.8



Cheese in brine: Sfela (Feta of fire)



Fig.9



Soft cheese: Anevato

Fig.10



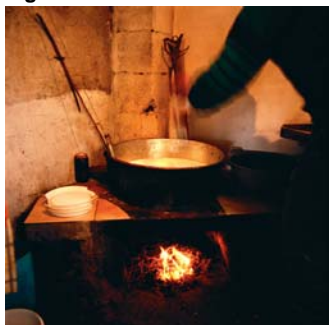
Soft cheese: Galotyri

Fig.11



Soft cheese: Xinotyri

Fig.12



Whey cheese: Myzithra



Myzithra ready for sale

Fig.13



Whey cheese: Xinomyzithra

Fig.14

