

TECHNOLOGICAL PROCESS OF ADDED VALUE CHEESE MAKING ON REGISTERED AGRICULTURAL HOUSEHOLDS IN VOJVODINA

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Abstract. The technological process of cheese making is a process of transforming milk as a raw material into cheese and value adding. Small producers at registered agricultural households (RAHs) use milk of good quality that they produced. Also, they produce cheese by applying skills and experience as an indispensable part of quality, in contrast to big dairy plants where milk originating from a large number of producers is used, and furthermore the production automation is applied. RAHs produce many traditional cow cheeses, and more recently, goat and sheep cheese production is growing. Lisnati cheese (rolled cheese), “podliveni” cheese with or without spices, cream cheese, brined cheese “kriška”, smoked goat cheese, various types of semi-hard and hard cheeses are products with added value, due to the good milk quality, as well as the specific technological process. Cheese yield contribute that profit is higher than in case when milk is sold to dairy plant. The aim of this study was to monitor the technological processes of the most important cheeses that are produced on RAHs in Vojvodina. Study is shown that quality should be constantly improved in order to achieve sustainability of these products on the market. When considering the assortment and quality of cheeses on RAHs in Vojvodina, it can be said that many of them have the characteristics of branding products. The impact of adding value to cheeses and other dairy products is manifested through higher primary milk production, employment and the livelihoods of people in the countryside, as well as the economic prosperity of small family farms in general.

Key words: traditional technology, cheese, registered agricultural households (RAHs), added value

Introduction

In the production on small registered agricultural households (RAHs) in Vojvodina, human and cultural resources are used in addition to natural resources, which are recognized as a factor of added value. The number of consumers that are looking for a healthier, fresh and unique product, where production and sales are close and in line with its requirements, is constantly increasing. It is important to point out that consumers in EU recognize quality of cheeses that are produced on small agricultural households and sold at an open market (*Havranek et al., 2012*). EU agricultural policy stimulates a certain form of extensive agricultural production that contributes to the protection of the environment, biodiversity and rural areas (*Samardžija et al., 2006*).

The production of value added dairy products provides a better profit than in case when milk is sold to dairy plant. It is also assumed that the trends of increased consumption of value added products will continue. This means that the investment in value added will be paid off more in the long run, but it is necessary to constantly monitor the market demands and that the product is always safe (*Živkov, 2013*). Small producers have a great possibility to develop and improve their own production through dairy products with a geographical origin (*Dozet et al., 2004; Popović-Vranješ et al., 2011*), as well as those with a particular specificity (*Đorđević et al., 2014*). Many of the cheeses that are produced on RAHs in Vojvodina meet the requirements for recognition of the origin (lisnati cheese, podliveni cheese, sremski cheese). Moreover, most RAHs provide conditions for hygienic production, storage and distribution as well as permanent control and education. The production based on the principles of good hygienic practice that guarantees the safety and quality of the product is essential. A support to producers is also provided by scientific and professional staff from the Faculty of Agriculture, Novi Sad (*Popović-Vranješ et al., 2015*).

Material and methods

The paper describes the technology, by surveying several cheese producers from the area of Vojvodina. For the last several years Provincial Secretariat for Agriculture, Water Management and Forestry of AP Vojvodina have supported small cheese producers in terms of plant adaptation, purchase of equipment, design and education. The activities were realized by the Faculty of Agriculture Novi Sad, in the period from 2013 to 2016. Moreover, cheese analyses were made at the Laboratory for quality control of feed and animal products, at the Faculty of Agriculture in Novi Sad. The composition of cheese was analyzed by applying standard methods. Weight loss after drying (*AOAC 926.08-1927*) was used for dry matter determination. Protein analysis was done by Kjeldahl-Van Slyke method for

total N determination (AOAC 2001.14). Fat content was determined using butyrometric method (AOAC 933.05). NaCl content was calculated from sodium content which was analyzed by flame photometry (Sherwood, type M410) using a method described elsewhere (Kirk and Sawyer, 1991).

Results and Discussion

Lisnati cheese

Lisnati cheese is characterized by its spun paste structure and belongs to the group of *pasta filata* cheeses. According to the literature data (Vujičić *et al.*, 1998), lisnati cheese has been produced in Vojvodina since the late 1970s. Considering kashkaval cheese, it is possible that the production of *pasta filata* (spun paste) probably existed before. On RPGs in Vojvodina, lisnati cheese is especially appreciated and highly sought after by consumers today. It is a cheese that is well sold, has a good price (800-900 RSD/kg) and it is also interesting from the aspect of production profitability. For the production of lisnati cheese, it is important that the one who directly produces cheese (cheese maker) has the skills required for its making. The best quality of the cheese, in terms of mixing and curd stretching, is achieved if the acidity of the mixture (sweet and sour milk) is 16-17 °SH while the pH value of the mixture is from 5.5 to 5.6 (Popović-Vranješ, 2015). Based on the technology recordings at some manufacturers, it can be noticed that there are differences which may reflect the quality, among other things. After stretching, the paste is shaped into a 1-3 kg roll, 10 cm in diameter and 20-30 cm in length. The stratification and the spun structure of the paste is clearly visible on the cross-section. It can be produced with or without both, spices and ham. Producers on RAHs, work in their modest conditions and with smaller amounts of milk, so the method of production mainly resembles the traditional old technology of the Balkan kashkaval cheese. Similar cheese is produced in Montenegro (Mirnečki *et al.*, 2012). Lisnati cheese is produced from raw cow, sheep or mixed milk, by letting 1/3 of milk to spontaneously ferment. The fermentation lasts for up to 24 h, resulting in a slightly sour and gentle curd. On the next day, the obtained curd is mixed with 2/3 fresh milk wherein the rennet is added, stirred well and heated at 36-37 °C. In the heated milk, rennet is added in such amount that milk is coagulated in about half an hour. After that, the resulting curd is cut and mixed in a warm whey until is shaped in a lump. Then the whey is decanted, the lump is divided into several parts and cooked (steamed) in water heated at 65-70 °C. Finally, the cheese mass is stretched into a spun paste.

Based on the composition, this cheese belongs to a group of full-fat cheeses, since the content of milk fat in dry matter is 52.03%. According to the moisture content in fat-free matter (71.65%), it can be categorized as soft cheese.

Lisnati cheese is a real specialty that is produced with various additives (spices, ham, etc.). It is also sold under the name “rolled” cheese. It has a characteristic of soft, elastic and smooth structure, mildly acidic (pH 5.3) and porcelain white color.

Table 1. The composition of different cow cheeses collected on RAHs in Vojvodina

Cheese type	“lisnati” cheese	Kashkaval	Podliveni	Podliveni with paprika	White brined cheese “kriška”	Cottage	Semi- hard
RAH*	Kikinda (S.T.)	Rusko Selo	Obrovac (J.L.)	Obrovac (J.L.)	Obrovac (J.L.)	Vrbas (M.I.)	Čurug (P.R.)
Fat (%)	23.52	25.60	16.00	17.00	21.80	3.67	24.10
Protein (%)	12.54	28.50	24.61	24.30	23.41	10.76	29.09
DM (%)	45.20	55.87	38.00	41.00	48.67	17.46	59.61
FDM (%)	52.03	44.03	43.00	40.00	45.00	20.87	39.42
MFFM (%)	71.65	58.52	67.85	67.46	65.64	85.62	52.79
NaCl, %	1.50	2.00	1.00	1.00	1.60	1.50	1.80

DM – dry matter; FDM – fat content in dry matter; MFFM – moisture content in fat free matter

* RAH locations, RAH owner’s initials in brackets

Kashkaval cheese

The production of kashkaval cheese in Vojvodina is based on traditional technology that is used for kashkaval cheese production on Stara Planina and Pirot area. This technology is mainly based on Balkan production technique from raw cow or sheep, or mixed cow and goat milk. The entire process of cheese making has remained specific and promising for small producers to date (*Mančić, 1994*). Immediately after milking, the milk is warmly pre-coagulated, and its acidity should be 8-9 °SH. If the milk is fresh, it is necessary to wait for acidity (biological ripening) to increase. When the acidity is increased, the liquid rennet is added in ratio 40-45 ml per 100 l. After the coagulation, when the curd looks nice, glasslike, when it ruptures when cut by knife, and when nice, clear whey starts to separate, the curd should be cut into cubes about 2 cm in diameter. Afterwards, the curd is mixed (crumbled) until the corn size grains are obtained. In the next stage, the curd is left to stand for about ten minutes to settle (“sediment”) and harden, and then the whey is separated and prepressed. After 1.5-2 h of prepressing, a cheese lump is obtained which is subjected to further processing. The curd is then cut with a knife into a 20x15x10 cm (weighing 2-3 kg) pieces and placed in a 20-cm thick layer on the cheese table until reaching a pH of 5.1-5.2 (baskia ripening). In a separate vessel or cheese boiler the water is heated to 70-80 °C and about 7% NaCl is added. Then, the baskia is cut into a perforated bowl (a stainless-steel basket) and “cooking (steaming)” is performed, whereby the cut mass is transformed into a rubbery, stretchy paste, with a gleaming look. A cheese is placed on a cheese table and a skillful master kneads it as the dough for bread. In the next stage, the cheese

is molded by placing it in a mold. Some producers, after putting cheese into the mold, narrowly puncture it using a 1-2 mm thick needle. A total of 20-30 punctures are made. Cheese is dried in molds for 24 hours. During this period, the cheese is flipped and dried. When the cheese is dry, it is transferred into the cooling chamber. After cooling, the cheese is packaged and can be sold. If it is desired to ripe the cheese, then it is placed in the chamber for ripening, where the temperature is 15-18 °C, and the humidity is 75-80%. During the ripening process, the cheese is nurtured and flipped. Kashkaval cheese is pale-yellow in color, paste is monolithic, partly spun and elastic.

Regarding kashkaval cheese that is sold almost fresh (Figure 1C), milk fat in dry matter was 44.03%, which is a little below the minimum for full-fat cheese (55%) prescribed by Serbian regulation (2014) and Institute for standardization of Serbia (*SRPS E.C2.010:1997*). The water content in fat-free matter corresponded to semi-hard cheese (55.87%). Considering its composition, it is very close to the standard for Pirot cheese (*Ostojić et al., 2012*).

Production of this cheese is present in a large number of RPGs in Vojvodina. This is because the technology is simple, it is mostly made from raw milk, thermal processing of curd ensures product safety, and it is sought on the market especially for the production of pizza. Finally, if not sold, it can be left to ripe, giving it a distinctive taste and smell of mature cheese made from the steamed cheese paste.

Podliveni cheese

Podliveni cheese is a variant of Serbian brined cheese with small modifications of technology, which is produced in some households from raw full-fat and or partially skimmed milk (cream is removed) (*Popović-Vranješ, 2015*). In the production of fresh milk (36 °C) on the household, 10 l of milk is poured into a deep pan. Four tablespoons of rennet are poured in 1 dl of water and stirring is performed for 5 min. Then, the curdled milk is left for about 40 minutes. During that time, the mass coagulates and looks like fermented milk. The following step is the curd cutting to large cubes which are then transferred into the cheese cloth and put into the press. The pressing lasts for 3-4 hours. For 1 kg of cheese, about 5 l of whole milk is utilized. In small dairy plants, which own duplicators, "podliveni" cheese is produced from full fat pasteurized milk. Pasteurization is done in a duplicate at 62-72 °C, where the milk is kept for 20 min. After pasteurization, the milk is cooled to 32 °C, liquid rennet is added and stirred. Then, the milk is allowed to settle, so the coagulation is performed in about 30 minutes. Normally, it is waited until the curd is separated from the container. The curd is cut into 15x15 cm cubes and it is allowed to settle for 15-20 minutes to isolate the whey. The curd is slowly released into the press and left for 30-60 minutes to self-press. Then it is progressively loaded for 1-2 hours, by slowly increasing the pressure to 1.5-2 bar. After pressing, the curd is cut, salted a little, and then the whey is released (not

immersed in whey). The produced cheese can be put up for sale on the next day (pH 5.2 - 5.7). Podliveni cheese from skimmed milk is produced on households so that the milk is cooked in deep pans (10 l volume) and the cream is removed (Figure 1D, 1E). The remaining milk is then heated to boiling point. In the heated milk, 1 liter of fermented milk, 4-5 tablespoons of vinegar and NaCl are added. The mass is left to cool to 50 °C and then transferred into the cheese cloth and put in a small press (Figure 1D, 1E). Before pressing into the curd, peppers and parsley leaves can be added. In the press, cheese stands for 50 minutes with a gradual increase in pressure. Finally, the cheese is allowed to stand in the press for another 15 minutes without being "tightened" (no additional pressure). After the pressing is completed, cheese is extracted from the press and left for 1-2 hours to stand at room temperature. Then, the cheese is placed in the refrigerator to cool. After that, it is cut into slices and can be packaged and sold. It is a soft, semi-fat cheese.

If required, podliveni cheese with cream cheese consistency can also be produced from skimmed milk, with some modifications. Milk is thermally treated at 62-72 °C for 20 min. After that, it is cooled to 32 °C, and calcium chloride, rennet and sugar (2 tablespoons/10 l) is added. Then, 0.2 l sour cream (containing 20% fat) and a small amount of NaCl (3 tablespoons) are added to 10 l of milk. Finally, the previously explained procedure for whole milk cheese making is used.

Serbian white brined cheese “kriška”

This type of cheese is made quite often in Vojvodina and it can be a replacement for white soft cheese, although in most cases it is near semi-hard cheeses. Fresh white cheese called Serbian white cheese or “cheese slice” (Serbian: *kriška*) is obtained by rennet coagulation of heat-treated milk. It is characterized by soft consistency, pleasant mild to lactic acid taste and white color. Before consumption it is usually stored in whey (Živković, 1971). On RAHs, fresh cow milk is heated at 18-20 °C during summer and at 25-30 °C in winter. The rennet is added into the pre-heated milk in the amount needed for the milk to curdle in 4-6 hours. In some households more rennet is added, so the curd is formed in an hour. The curd is cut crisscross into 4 pieces using a clean knife, and then into cubes. The green and clear whey that comes out of the curd is a sign that the milk is well coagulated. The curd is then placed in a cheese cloth and left to strain. Occasionally, it is shaken for the whey to come out. Then, the cheese cloth containing the curd is removed and placed on a cheese table. A plank and a stone are placed over the cheesecloth, or the pressure is applied using a vessel with water. This is the second stage of pressing. The pressure should be about 1-2 kg per 1 kg of curd. The cutting and pressing lasts 6-12-24 hours and continues until the cheese curd is well strained. The straining in winter can be done in the kitchen, and during summer months in the basement or other cooler room, so the cheese does not get over-fermented or spoiled. After the straining, the cheese curd is removed from the cheesecloth and cut into slices. Each slice is then salted on all sides and

when NaCl is absorbed, slices are put in ripening vessels (usually plastic bins). Each row of cheese slices is salted, and the container is filled up to the top. After a couple of days, the plank is placed on the cheese and pressed. When the cheese settles, the container is filled with more cheese. Cheese ripening lasts 2-3 weeks, and well-produced cheese can be kept for months. The production of this cheese itself is not difficult. It requires fresh cow milk, skillful staff and hygiene during cheese making. About 100 liters of milk yield approximately 10 kg of cheese. The specificity of the production of this type of cheese in brine is the use of raw milk as well as certain stages of the technological process. The curd processing and straining are directed to obtaining a cheese high in moisture and a soft curd. Salting is done using dry salt and in brine. At the beginning of ripening (2-3 days), when the intense development of lactic acid occurs, there is no pressing. Later, the ripening is done under pressure in salted whey or salted water (brine). After ripening, the cheese is packed and soaked in brine, and it goes on the market (pH 5.12, acidity 26.80 °SH). Kriška cheese of a good quality must have moderately sour-salty taste with a hint of unripen wall nuts. In the beginning, this taste is strongly pronounced, while with the ripening it slightly decreases. On the cross-section, the cheese has no or only few round holes. Technical holes are visible but in a small number, since it is a cheese with very small pressing. Mature cheese must melt in the mouth, although it is firm under the fingers (*Živković, 1971*). Based on the laboratory tests, this is a semi-hard (moisture in fat-free matter was 65.64%) and full-fat cheese (45% fat in dry matter).

Cottage cheese

In most households, cottage cheese is made from completely or partially skimmed milk. The production of cottage cheese with yogurt culture is a very interesting product and a relatively new technology that has found great application in smaller dairy plants (*Popović-Vranješ, 2015*). It is a cottage cheese that is widely used in the bakery industry and is quite demanded and profitable product. The skimmed milk (0.5-1%) is highly pasteurized (92 °C for 10 minutes), cooled to 45 °C, yogurt culture is added and allowed to ferment to 30 °SH (pH about 4.6). In this way, yoghurt is practically the first to produce. Then, gentle mixing and slight warming up to 65 °C for 15 minutes is involved. If the cheese is made from full-fat milk, the curd is heated to a higher temperature (65-70 °C for 15 minutes). When the required temperature is reached, the mixer and heat source are switched off, and it is waited for the curd to form in 20-30 minutes.

Next, the mass is slightly cooled to 55-60 °C and released into cheesecloth to strain. If the cheese is made from the skimmed milk, the straining takes about 2-3 hours, and if full-fat milk is employed this is 4-5 hours at room temperature. After straining, cheese is placed in the container, then mixed and salted (just under 1% NaCl). After that, the cheese is transferred into the refrigerator and cooled to 4-8 °C. Finally, it is packed in 10 kg plastic containers or 500 g plastic bags. Cheese

yield from skimmed milk is from 3.5 to 4.0 l/kg, while from full-fat milk this is 3.1-3.3 l/kg. Based on the water content, consistency and paste structure, this cheese belongs to a group of fresh cheeses (*Serbian regulation, 2014*). Considering the water content in fat-free matter of cheese (more than 80%) this product can be categorized as soft cheese. The taste is sourly (pH 4.40-4.58, 35.45-36.22 °SH) and salty, consistency is creamy, and no whey is separated. It is practical for use in the production of pies and various cheese pastries.

Semi-hard cheese

Semi-hard cheese is mainly made by producers who have production equipment and a chamber for ripening. Cheese is made of pasteurized milk, which is cooled to 31-32 °C, with the addition of calcium chloride (0.02%) and mesophilic culture. After biological ripening of milk, rennet is added and left for 40-60 minutes to coagulate. Afterwards, the curd cutting, and mixing is performed. Next, the curd is heated at 36-38 °C and slowly mixed to the size of the pea grain (20 min), followed by molding and pressing. Salting in brine (containing 18% NaCl) for 1 day is applied when the pressed cheese pH is 5.3-5.4. After salting, the cheese is dried in the room where it is salted and then transferred to the chamber for ripening (relative humidity 75-80%, temperature 14-16 °C). During the ripening, cheese is cultivated (flipped and coated with salty water or Plasticoat®). Some manufacturers place cheese in semi-permeable foil, vacuum it and leave it to ripe. After ripening is done (2-3 weeks) cheese is packed and sold. Based on the content of fat in dry matter (39.42%) it can be categorized as a full-fat cheese, and on the basis of the moisture content in fat-free matter (52.79%) this cheese belongs to a group of semi-hard cheeses (*Popović-Vranješ et al., 2004*).



Figure 1. Cow cheeses from RAHs in Vojvodina. (A) Lisnati cheese, (T.S) Kikinda, (B) Lisnati cheese, (T.S) Kikinda, (C) Kashkaval cheese, (M.R.) Rusko selo (D) Podliveni cheese, (L.J.) Obrovac (E) Podliveni cheese, (L.J.) Obrovac, (F) Kriška cheese, (L.J.) Obrovac, (G) Cottage cheese, (M. I.) Vrbas, (H) Semi-hard cheese, (P.R.) Čurug

Goat milk cheeses

At this moment in Vojvodina, the entire amount of goat milk is processed in the traditional way and is done mostly on RAHs of goat breeders. There are some differences in the technology on individual farms that are usually linked to the cheese assortment. In the goat cheese assortment, which is getting larger every day, there are mostly white kriška cheeses that are sold in brine or vacuum, semi-hard or hard cheeses in vegetable oil with olives and various spices, various varieties of fresh cheeses in the form of cream cheeses with and without various spices. Semi-hard cheeses are also produced quite often, while hard cheeses are produced somewhat less. Some RAHs also produce smoked cheese. There are producers who produce kashkaval and rolled cheese made from goat milk.

Goat brined cheese “kriška”

The production of goat brined cheese “kriška” is done from raw or pasteurized milk, depending on the producer. If the production includes raw milk, then the milk is used immediately after the milking while it is still warm. The rennet is added, mixed and left for an hour. When a nice curd is obtained, the whey is drained. A small amount of warm water is added, the mixture is mixed, and then waited for whey and water mixture to separate. The mass is transferred into the

mold and the whey is drained by self-pressing. The cheese is cut into slices, packed and sold. Some manufacturers place cheese in jars, add vegetable oil and various spices. Manufacturers who have appropriate equipment, produce kriška cheese from pasteurized goat milk. Into the milk heated at 36-37 °C, calcium chloride and mesophilic culture are added, and the milk is kept a bit to biologically ripe. Then the rennet is added, and the milk is left to coagulate (about 1h). Further, crisscross cutting, cutting into cubes, short mixing without reheating, and curd transferring into the pre-press is performed. Pressing takes 1-1.5 h (low pressure 1-1.5 bar) on the pre-press. Then, the cheese slices are arranged into containers and dry salting (1.5% NaCl) is done. The pH is 6.5 and the height of slices is 3-4 cm. The cheese is quite soft and gentle when it is arranged. Arranged and salted in such manner, the cheese is pressurized for 12 hours. The next day, cheese pH is 5.2-5.4. Some producers immediately cut the cheese, vacuum it and put it up for sale, while others leave slices to ripe a bit longer. The ripening is performed in brine (4% NaCl) at 15-16 °C for about 10 days. At that moment, the cheese pH is 4.2, it is sufficiently solid and compact, and slightly sour. As such, it is sold in bins, or washed in water, dried and then packed in vacuum bags. According to the laboratory tests, the moisture content in fat-free matter was ranged from 70.75 to 85.06%, which categorizes it as soft cheese, and based on the fat content in dry matter (45.59-45.83%), it is a full-fat cheese (*Serbian regulation, 2014*).

Table 2. The composition of goat cheeses collected on RAHs in Vojvodina

Cheese type	Kashkaval	Brined cheese "Kriška"	Hard cheese	Semi-hard cheese	Semi hard cheese with spices	Soft brined cheese "kriška"
RAH*	Karadordevo (M.Č.)	Karadordevo (M.Č.)	Kanjiža (E.K.)	Srpski Krstur (J.B.)	Srpski Krstur (J.B.)	Srbobran (K.D.)
Fat (%)	22.40	25.00	27.50	26.60	24.99	20.06
Protein (%)	24.00	23.36	23.00	24.08	25.12	19.45
DM (%)	58.35	46.86	60.08	58.74	60.31	44.00
FDM (%)	45.39	53.35	45.83	45.22	41.44	45.59
MFFM (%)	65.27	70.75	55.24	56.28	50.92	85.06
NaCl, %	2.00	2.10	2.00	2.87	2.00	1.50

DM – dry matter; FDM – fat content in dry matter; MFFM – moisture content in fat free matter

* RAH locations, RAH owner's initials in brackets

Semi-hard and hard goat cheese

Semi-hard goat cheese is produced in the same way as semi-hard cheese from cow milk, except the curd is processed at a lower temperature (36-37 °C). The curd is slightly gentler and placed in molds. At the beginning, more frequent flipping in the molds is performed. Later, the frequency decreases. The molded cheese is placed in brine (containing 17-18% NaCl) for 24 hours, and then dried. After this, the cheese ripens at 14-16 °C, relative humidity of 75-80%, and

ventilation of 4 air changes/24h). The ripening can be in foil and without foil, and takes 2-3 weeks. During the ripening process, the cheese is flipped. In case of cheese ripening process without foil, in addition to flipping, cheese nourishing is performed. Some producers place the cheese into nettings and exposed it to a smoke for a few days. Then, the cheese is vacuumed and sold.

Hard goat cheese is produced from pasteurized milk (72 °C) cooled to 32 °C, then calcium chloride, mesophilic and/or thermophilic cultures are added. When the milk is ripened, the rennet is added. Once the cheese curd is firm enough it is cut, and the cheese grain is processed at 38-40 °C. Further, the cheese grain is transferred to the pre-press or directly into the molds. The pressure per kilogram of cheese is initially lower, and later it reaches up to 3 kg/kg of cheese. During a 4-hour pressing, the cheese should be flipped twice so that microbiological processes could be developed as smoothly as possible. Pressed cheese is salted in brine for 24-48 hours, depending on the size of the cheese. Brine is maintained at 11-14 °C and an acidity of 18-20 °SH. The NaCl concentration should be 20% or 19 °Be. After salting is done, cheese is placed to ripen at 14-18 °C and relative humidity of 75-85%. In ripening room daily care is done, and includes cheese rubbing using cloth pre-dipped in NaCl solution, cheese flipping, manual cheese coating, repeatedly. Cheese ripening takes 60 days in total. After ripening is finished, cheese is packed and placed on the market. Table 2 shows the composition of goat cheeses on individual RAHs. In figure 2, goat cheeses from individual farms are shown.



Figure 2. Goat cheeses from RAHs in Vojvodina. (A) Kashkaval cheese, (M.Ć.) Karadordevo, (B) Smoked cheese and cheese with spices (J.B.) Srpski Krstur, (C) Kriška cheese, (K.D.) Srbobran (D) Hard cheese, (E. K.) Kanjiža

Bearing in mind the requirements of the *Serbian regulation (2014)*, the composition of goat cheeses, with small deviations, was in accordance with the regulation. In terms of sensory properties, taste, smell, appearance and cross section, cheese is highly rated.

Considering the assortment and quality of cheeses from RAHs in Vojvodina, it can be said that many of them have the characteristics of branding products. Branding creates a picture of the added value for consumers. The food brand promises consumers food with added value (healthy, local, organic) (Đorđević et al., 2014).

Conclusion

This paper describes the technology of making important dairy products with added value on RAHs in Vojvodina to bring the production technology to a level that ensures high and standardized quality, and safe product in order to fulfill all the necessary conditions for acquiring the label originality and geographical origin. This can be achieved by encouraging the cooperation among individual

producers, scientific institutions and competent ministries. Many of the described products are missing or insufficient on the market. By investing in premises and equipment on RAHs, conditions in the technical and technological area have been created for the production of the described products. Correspondingly, this facilitates production, and increases the quality and quantity.

In the future, there is a need for branding certain cheeses from Vojvodina that are produced on RAHs. Formation of added value as a result of consumer skills and territorial strategies is becoming increasingly important. Adding value to products strengthens the territorial capacity of the area, improves the image of the territory and increases employment.

Tehnološki proces izrade sireva sa dodatnom vrednošću na registrovanim poljoprivrednim gazdinstvima u Vojvodini

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Rezime

Tehnološkim procesom izrade sira se vrši transformacija mleka kao sirovine u sir i dodavanje vrednosti. Mali proizvođači na registrovanim poljoprivrednim gazdinstvima (RPG) koriste svoje vlastito mleko koje je kvalitetno, proizvode sir primenom veština i iskustvo kao neizostavan deo kvaliteta, za razliku od mlekara gde se koristi zbirno mleko velikog broja proizvođača i koristi se automatizacija proizvodnje. Mali proizvođači na RPG proizvode veliki broj tradicionalnih sireva od kravljeg, a u novije vreme sve više i od kozjeg i znatno manje od ovčijeg. Lisnati sir (rolovani sir), podliveni sir sa i bez začina, sir-kajmak, sir kriška, kačkavalj od kravljeg i kozjeg mleka, dimljeni kozji sir, razne vrste polutvrdih i tvrdih sireva, su proizvodi sa dodatom vrednosti, kako zbog kvaliteta mleka, tako i specifičnog tehnološkog procesa. Randman sireva je takav da se prodajom mleka kroz sir znatno povećava ukupna zarada. Na osnovu praćenja tehnološkog procesa proizvodnje sireva sa dodatom vrednosti na RPG u Vojvodini, konstatovano je povećanje kvaliteta koji se za duži opstanak na tržištu, stalno mora unapređivati. Kada se posmatra asortiman i kvalitet sireva sa RPG u Vojvodini, vidi se da mnogi od njih poseduju karakteristike proizvoda za brendiranje. Uticaj dodavanja vrednosti sirevima i ostalim mlečnim proizvodima, pokazuje se kroz veću primarnu proizvodnju mleka, zaposlenosti i egzistenciju ljudi na selu, u celini ekonomski prosperitet malih porodičnih gazdinstava.

Ključne reči: tradicionalna tehnologija, sir, RPG, dodata vrednost

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