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**Development of Milk Commodity Chain in Bosnia and Herzegovina**

Diploma thesis

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Brno 2016



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## **ABSTRACT**

REDŽANOVIĆ, E. *Development of Milk Commodity Chain in Bosnia and Herzegovina*. Brno: Mendel University, 2016

Focus of this Diploma thesis is to analyze evolution of Milk Commodity Chain in Bosnia and Herzegovina in terms of the ongoing integration processes. In order to describe Milk Commodity Chain in Bosnia and Herzegovina author used Official Statistical Data from following sources: Statistical Agency of BiH, Federal Office of Statistics of FBiH, Institute for Statistics in RS, Milk Processing, Sarajevo, Ministry of Trade and Economic Relations, Federal Ministry of Agriculture FBiH and Ministry of Agriculture in RS. Furthermore following technological flow of material, "From Farm to Final Consumer", author characterized crucial milk markets in Milk Commodity Chain, milk marketing routes in BiH. Final section defines the issues of the amount and structure of production and price levels of raw materials. In conclusion that good cooperation and partnership within Milk Commodity chain is necessary, and only strong milk industry will make strong milk production.

**Key words:** agriculture, farmer, primary production, processing, market

## **ABSTRAKT**

REDŽANOVIĆ, E. *Rozvoj komoditního řetězce mléka v Bosně a Hercegovině*. Brno: Mendelova univerzita, 2016

Diplomová práce se zabývá analýzou vývoje komoditního řetězce mléka v Bosně a Hercegovině, ve smyslu probíhajících integračních procesů. K popisu komoditního řetězce mléka v Bosně a Hercegovině autor se používá oficiálními statistickými údaji z těchto zdrojů: Statistický úřad Bosny a Hercegoviny, Úřad pro statistiku FBiH, Institut pro statistiku RS, Milkprocessing Sarajevo, Ministerstvo zemědělství. Sledující technologický tok material, "ze zemědělského podniku konečnému spotřebiteli", autor vyznačuje klíčové trhy mléka v Bosně a Hercegovině. Poslední část vymezuje problematiku výši a struktury produkce a výrobních a cenových hladin surovin. A konečně v závěru, že dobrá spolupráce a partnerství v rámci komoditního řetězce mléka je nezbytný a pouze silný mléčný průmysl učiní silnou produkci mléka.

**Klíčová slova:** zemědělství, zemědělec, primární výroba, zpracování, trh

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# 1 INTRODUCTION

Bosnia and Herzegovina (BiH), one of the constituent republics of the former Yugoslavia in the period between 1945-1991 is located in the western part of the Balkan peninsula and covers an area 51,129 km<sup>2</sup>. In 1990, the first democratic elections were held in Bosnia and Herzegovina and in early 1992 became an independent country. BiH has borders with Serbia to the east, Montenegro to the south-east, Croatia to the north and west, and a 20 kilometres coastline on Adriatic Sea called Neum. Landscape varies from high altitude mountains in the centre, to arable land in the north and Mediterranean vineyards in the south, with most of the major towns being located in the valleys.

Bosnia and Herzegovina after Dayton Agreement in 1995 is divided into two entities and Brčko District (BD). The entity, Federation of Bosnia and Herzegovina (FBiH) covers about 50 percent of the territory and entity Republic Srpska (RS) covers about 49 percent of the territory. Brčko District is a self governing administration under the direct jurisdiction of BiH. The population is estimated at a little less than 4 millions. The capital of BiH is Sarajevo.

In the context of economic system agriculture in BH has important role. The specificity of agricultural production is that it takes place in a wide area and dominantly under open sky of rural areas. It is estimated that about 61% of population in BH lives in rural areas and after Montenegro, Ireland and Finland it is biggest rural country in Europe. Agriculture is vital for rural population and peasant is a pillar of Agriculture. Traditionally one of the main activities of Bosnian peasant is livestock farming in rural regions. Importance of livestock production is following that BH's territory is mainly the mountainous region covered with spacious woods and grasslands, providing favourable conditions for cattle, in particular of dairy cows. Natural resources are well preserved, favouring excellent conditions for development of livestock farming.

Livestock farming is considered to have biggest potential in development of agriculture. Within livestock farming, milk production have strategic role in Bosnia and Herzegovina. Regarding some estimations that about 300,000 agricultural farms keep some kind of livestock, out of what about 100,000 have cows and about 30,000



households produce milk for market, shows importance of this sector for Bosnian rural population and BH as a country.

In order for primary milk production to fulfil given role, strong and stable milk industry is a key, and vice versa. Agriculture has emerged as most vulnerable sector after war and both milk production and milk industry suffered enormous war damages. In some areas damages reached 60 to 70% of moveable (equipment and livestock) agricultural assets. Within milk production due to inadequate feed has come in decrease of already low milk yields. Enormous damage from war suffered milk industry, numerous buildings has been destroyed or damaged, and equipment for transport and coolers. Reconstruction of sector and renewal of herd and mechanization started immediately after war financed through numerous national and international projects.

In milk industry most dairies had recovered their pre-war status and new dairies were established until 2003. For instance number of new dairies in eight years outnumbered five times pre-war one, and comparing to 11 dairies that operated 1992 in 2003 there were about 50 dairies in Bosnia and Herzegovina. However domestic milk production in pre and post-war state was not able to follow milk industry, as domestic production of raw milk was not able to meet consumer demands. Data confirm this situation in primary production as availability of milk was about 29% in 2000 comparing to total prewar production. In Federation of BH and Republic of Srpska old and new capacities increased their processing capacities however still on the low level of capacity utilization due to the lack of raw material and strong imports. Bosnian and Herzegovinian unprotected market was flooded with imports from countries that impowered their export positions using unpreparedness of domestic milk sector without solution for situation.

What happened further is story from shelves of domestic supermarkets and shops filled with rich supply of milk and milk products. Between them are brands mainly origin from Slovenia, Croatia, Germany and Italy with big supply of milk, milk products and cheese.

Where is today Bosnian and Herzegovinian milk industry after twenty years? In what way primary milk production developed and does it follows milk industry and vice versa. And how is the situation in the supermarket's today? Numerous studies and researches dealt with milk production and milk industry and generally with problems

in this sector, providing detail analysis resulting in good information about situation, characteristics, obstacles and possible solutions. However lately small number of these researches has been focused on development of milk commodity chain and ongoing integration processes of this sector. Therefore focus of this research is on development of milk commodity chain in Bosnia and Herzegovina.

## **2 A REVIEW OF RELEVANT LITERATURE**

Sector of milk production, milk processing and milk commodity chain overall was topic of numerous researches in Bosnia and Herzegovina as well as topic of research of international experts, analysts and scientists. Numerous scientific and expert works in this field are published.

Firstly *Selak et al.*(2003) in their research that analyzed Economic and Social Role of Agriculture in Bosnia and Herzegovina emphasized following; Agricultural production and rural areas have been destroyed in the war. Post-war reconstruction and restoration to some extent managed to raise the level of agricultural production, which in the absence of purchase channels has an important role in non-market supply and food security of farming households. A typical example of this is production of milk.

Furthermore *Selak et al.*(2003) analyze possibilities of BH's production and processing of milk. Within research primary milk production is rated as unable to meet demand on domestic market, which eventually led to low level of capacity utilization in dairies. Furthermore is emphasized that increase in primary milk production can be reached by growth and reproduction of heard, for what education and access to finances are necessary conditions. In milk processing range of products is insufficiently diverse and is consisted of short-term products, what is one of primary causes of bad market position of BH dairies. Causes of insufficient capacity utilization are lack of raw material in BH environment, and lack of market position in competing strong foreign competition. Attraction of MEGGLE in Bihac Milk Industry (BIM) and Ljubljana dairies in Tuzla Milk Industry, authors see as good business ventures that could be an example and step in development and growth of milk processing in BH. Authors see solution for all dairies no matter of size and production orientation in good marketing that will extend their production on new products, such as special sheep and goat

cheeses, fruit yogurts, milk and yogurts with addition of flavoured products, cheese spreads with addition from domestic ecological environment, ice-creams etc.

In a study “*Assessing of competitiveness of three value chains in Agriculture of BH*”(2012) three sectors on level of BH’s industry was analyzed (Milk sector, Meat sector, Fruit and Vegetable sector). Milk sector and sector of milk products is considered as most competitive sector in Agriculture of BH. Market for milk sector showed growth and export from BH achieves higher market share. Market trends show relatively optimistic image of future growth on global market as well on EU market with increased competition, considering other countries increase their production. Study showed that general competitiveness on international market is still low, mostly due to the low level of quality, high prices and range of products that doesn’t meet consumer demands

“*Strategy for increase of competitiveness in Federation of Bosnia and Herzegovina*” published in Official Newspapers of FBiH in 2015 in analysis showed latent comparative advantages of milk sector in future. Potential of milk sector is highlighted through next latent comparative advantages: favourable natural conditions, within what abundance of agricultural land, availability of uncultivated land, soil quality, favourable weather conditions, resource of clean water and relatively of low pollution level that are considered to be main factors and could be converted in competitive advantage of Milk Chain of BH. As well as qualified workforce (engineers, technicians, trained workers) and availability for competitive prices in comparison with EU-28. Geographical location is relatively favourable and proximity of main markets (EU-28).

A study on “*Competitiveness in the agricultural sector of Bosnia and Herzegovina*”, *Bajramovic et al.* (2006) analyzed competitiveness of milk production and processing sector. Based on DRC indicators in primary milk production authors concluded that BH producers of milk possess competitive potential to deal with import products, relating on farms analyzed within study, that are mainly commercial farms with above 5 cows, farms in possession of number of cows above average number of cows in BH. The main limiting factors in production authors see in low yields and small size farms which lead to high production costs of milk. Furthermore low level of technological knowledge of

farmer's and bad quality of forage contribute to this problem. A large number of small producers increase costs of milk collection and additionally contribute negative hygienic aspects. Authors do not consider farmer's negligence as main factor for bad hygiene, however rather in lack of knowledge, and in longterm authors considered that unfavourable structure in milk production continue due totwo reasons. First one is that structural changes are always quite slow and second one is inefficient land market, inadequate law of inheritance and low employment out of agriculture.

*Bajramovic et al. (2007)* in a study analyze challenges before agriculture of BH in European integration process. Authors stand out positive trends in primary milk production, increase of livestock number, growth of cow productivity, increase of number of modern farms, improvement in breed composition and commitment of farmers for market production. Authors consider that milk industry in BH shares problems of other sectors of food industry. Most significant is lack of raw material on domestic market influencing on low capacity usage (36%), reflecting negatively on economic position and business results of dairies.

### 3 OBJECTIVE AND METHODOLOGY

Main objectives of this research are following:

- I. The aim of the thesis is to describe the Milk Commodity Chain in Bosnia and Herzegovina and to analyze its evolution in terms of the ongoing integration processes.
- II. Furthermore the aim is to define Milk commodity chain in the context of technological flow of material. Characterize crucial markets within the commodity chain, define characteristics of different stages of the chain in business environment in Bosnia and Herzegovina.
- III. As part of this research, is to focus on the issues of the amount and structure of production, price levels of raw materials and other products in selected dairy processing stages.

Methodology and data resources employed in this research are used from following sources:

- The Statistical Agency of Bosnia and Herzegovina;
- The entity statistical offices:
  - i. Federal Office of Statistics of Federation of Bosnia and Herzegovina (FBiH)
  - ii. Statistical Office of Republic of Srpska (RS)
- Ministry of Foreign Trade and Economic Relations
- Milkprocessing, Sarajevo
- Official Journal of Federation of Bosnia and Herzegovina
- Federal Ministry of Agriculture, Water Management and Forestry
- Ministry of Agriculture, Forestry and Water Management in RS
- Indirect Taxation Authority of BH

Considering official statistics provided and mentioned above, the author himself emphasizes certain limitations in the statistical methodology employed. As part of the input to official statistics, each farm registered as a legal unit, company or cooperative, is obliged to provide annual report on livestock number to its statistical office. However some farm units/enterprises do not provide always data, therefore slight underestimate of the true position in these numbers is possible.

The number of cows on each kind of private farms and households is provided by estimators in each municipality and not by any structured survey or census methodology. The entity and state-level statistical bodies are currently in the process of developing new methods of data collection in line with international and Eurostat standards.

## 4 MILK COMMODITY CHAIN

### 4.1 Household and Farm Structure

The size of private small farms was limited to 10 ha on flat and hilly land whilst in mountain regions farmers were allowed to own up to about 30 ha during the period of the Socialist Federal Republic of Yugoslavia (1945-1991).<sup>1</sup> Private properties and farms were not much favoured by the government, and full attention was paid only to state farms. In the pre-war agriculture full-time was engaged about 21% of active population and about 14% of the workforce with a partial participation. The GDP in agriculture has accounted for 12-14%.<sup>2</sup> In BiH was estimated 500.000 agricultural holdings in 2006, more than 50 percent are estimated to be less than 2 hectares, over 80 percent are less than 5 hectares. Small farms are often divided in 7-9 small parcels creating problems for productivity and overall efficiency. The share of agriculture in overall GDP has decreased steadily from 2004 to 2009 (8,9% to 7,6%), and to 6% in 2014.

Dominant form of farm structure in Bosnia and Herzegovina are subsistence farms which consume the majority of their production and produce only little marketable surplus eventually intended for very small market (small villages). Evidence show increasing number of small farmers producing for market. Furthermore most commercially oriented farms tend to be larger with restrictions in development due to the fact of their status as partially privatized entities which limits their access to and use of modern management and investment capital, leasing parts of their land to private smaller farms. The general problem of inadequate and uncoordinated data extends also to cadastral and landownership data much of which have not been updated since the war and so do not reflect the current situation. There is no farm or statistical register, lacking official data on the numbers of landowners or agricultural households.

It is difficult to estimate exactly how many households are involved in livestock production in some form, however it is assumed that total number of households in BiH with livestock may be estimated at around 310,000 (of which 161,000 is cattle).

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<sup>1</sup>Čustović, H. & Ljuša, M. Participatory Land Use Development in Bosnia and Herzegovina.p. 1

<sup>2</sup> Selak et al. „Milk market and role of family farms“. p. 1

## 4.2 Farmers – Primary milk production

The available natural resources in BiH are more inclined to the livestock production than plant production due to this fact livestock production has a dominant role and importance. Milk production is important source of income and employment for population in rural areas.

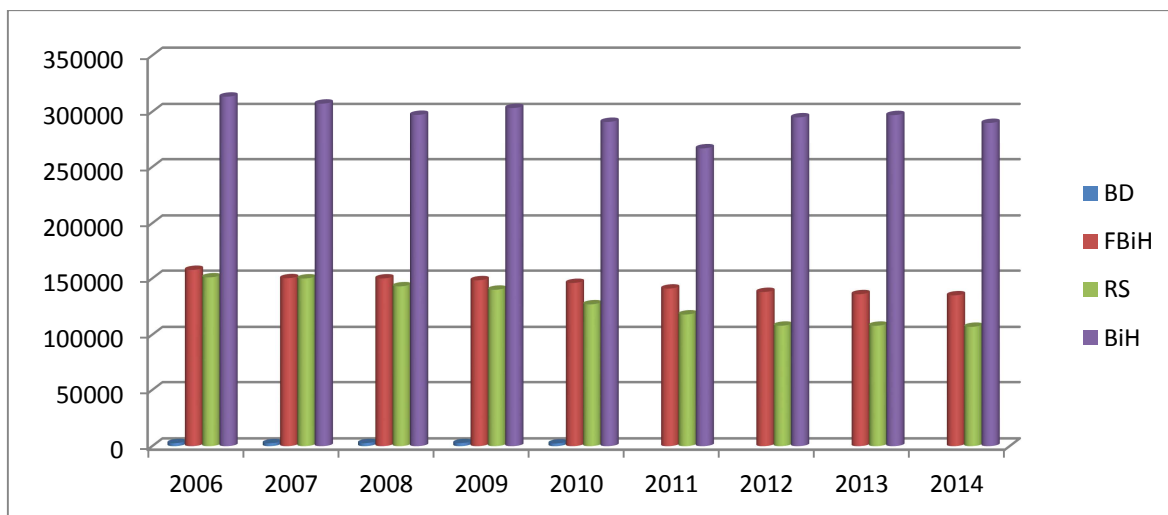
*Table 1 - Structure of farms in Bosnia and Herzegovina (2010)*

Farm Size	Number of farms	Farms % of total	Heads/Farm	Total of heads	Number of cows (%)
to 5 heads	18,360	84,42	1,7	31,212	50,6
5-10heads	2,445	11,24	5	12,225	20,4
10-20heads	683	3,14	11	7,513	12,5
20-200heads	252	1,16	22	5,544	9,3
Large farms	8	0,04		4,190	7,2
Total	21,748	100,00		60,684	100

*Source: Milkprocessing, Sarajevo*

Research published by Milkprocessing Sarajevo shows latest estimates of the number of farms and farm structure showed in Table 1 in 2010. 18.360 (84,4%) farms of size up to 5 heads per head, on the other hand 15% of farm structure are farms of size above 5 cows. Number of cows in BiH shown in Figure 1 slightly declined in the period from 2006 to 2014.





**Figure 1 - Number of dairy cows in BiH; Federation of BiH, RS and Brcko District (2006-2014)**

*Source: Agency for statistics of BiH, Federal office of Statistics FBiH, Institute of Statistics RS*

Situation is similar at the level of the two entities. In the Federation of Bosnia and Herzegovina number of cows has decreased from 2006 to 2014. In 2006 the number of dairy cows was 157,600, while in 2014 data recorded 135,000 dairy cows. In a period of eight years, the number of dairy cows has decreased by 22,600 dairy cows, a total decline of 14.3% of the number of dairy cows in the Federation of Bosnia and Herzegovina. In the Republic of Srpska is recorded in the same period a bigger decline in the number of dairy cows by 29.1% or number of 44,000 milk cows, with 151,000 dairy cows in 2006, data from 2014 showed in Table 2 a decline of dairy cows to 107,000 in this entity. In the Brcko District from 2006 to 2009 has been recorded an increase in the number of dairy cows from 25,000 to 27,000. Preceded with decrease in 2010 to 24,000 of dairy cows, data from 2010 to 2014 is not available in official statistical offices for Brcko District. On the level of Bosnia and Herzegovina has been recorded decrease of number of dairy cows in the period 2006 to 2011 of 14.8%. Between 2012 and 2014 the number of dairy cows has increased by 9%, and according to the latest data, the number of dairy cows stood at 290,000.

**Table 2. Number of dairy cows, production and purchase of milk in BiH from 2006 – 2014**

	Year	Number of cows 000 heads	Production of milk in 000 of litres	Average yield per cow	Purchase of milk 000 of litres	Marketability %
	2006	157,6	312062	1975	93228	30
	2007	150,2	313330	2088	97484	31
	2008	150	322300	2148	110025	34
	2009	148,4	321096	2163	106238	33
<b>FBiH</b>	2010	146	316997	2178	98331	31,5
	2011	141	315281	2251	103996	33
	2012	138	319260	2315	101170	31,6
	2013	136	330387	2433	98090	29,6
	2014	135	348549	2577	116100	33,3
	2006	151	340832	2213	64538	19
	2007	150	401121	2555	71295	17,7
	2008	143	405100	2580	90331	22,3
	2009	140	405183	2800	95643	23
<b>RS</b>	2010	127	368000	2797	97509	26,5
	2011	118	345000		96450	28
	2012	108	327000		115010	35,2
	2013	108	329285		104671	31,7
	2014	107	310000		95805	30,1
	2006	2,5	10200	3900		
	2007	2,6	9800	3630	2740	28
<b>BD</b>	2008	2,7	9800	3640	2218	23
	2009	2,7	10000	3700	2542	26
	2010	2,4	7688	3203	2614	34
	2006	313,4	663224	2103	177727	27
	2007	307,2	714451	2327	192434	27
	2008	297,2	737200	2376	235437	32
	2009	303,3	742000	2446	222610	30
<b>BiH</b>	2010	290952	724656	2490	214556	29
	2011	266551	667158	2502	213026	32
	2012	295	675376	/	232600	34
	2013	297	666872	/	209000	31,3
	2014	290	665208	2690	225000	33,8

Source: The number of cows and milk production: Agency for statistics of BiH, Federal office of Statistics FBiH, Institute of Statistics RS, Agency for breeding and selection in livestock RS. Purchase of milk: 1.Milkprocessing 2. Ministry of Agriculture, Forestry and Water Management in RS 3.Ministry of Agriculture, Forestry and Water Management in FBiH.

Milk production in Bosnia and Herzegovina and at the entity level is somewhat different according to the data. Total milk production in BiH in the period 2006-2009 has increased from 663 to 742 million litres, an increase of 11%. From 2010 to 2012 production decreased to 650 million litres of milk in 2012. After which it was about 665 million litres of milk in 2013 and 2014. Given the decline in the number of dairy cows in the Federation of Bosnia and Herzegovina, milk production varied with a slight increase in the period between the years 2006 and 2014. Milk production from 2006 to 2008 increased from 312 to 322 million litres of milk. After that, there is a slight decrease from 2008 to 2011 by 2%. In the period from 2011 to 2014 production increased, and in 2014 the data record 348 million litres of milk produced in this entity. In the Republic of Srpska has been recorded higher milk production in the same period but with bigger decline in milk production same as the number of dairy cows. Milk production increased in the period between 2006 and 2009, from 340 to 405 million of litres of milk. In the period from 2010 to 2014 was recorded a bigger drop in milk production in the amount of 24%. In the same period was recorded larger decrease in the number of dairy cows.

Average milk yield per cow in Bosnia and Herzegovina is presented in the fourth column of Table 2. According to official data the average milk yield in BiH in the period 2006-2014 has increased from 2,103 to 2,690 litres. In the same period in the two entities has been recorded an increase in milk yield per cow during. In the Federation of Bosnia and Herzegovina yield per cow has increased from 1,975 to 2,577 litres per cow in the period of 2006 and 2014. In the Republic of Srpska has been recorded higher average yield per cow from 2,800 litres in 2009 and 2010.

Purchase of milk in Table 2 in the period from 2006 to 2014, grew in Bosnia and Herzegovina, as well as at the level of the two entities (see column 5) and marketability increased fairly. Structure of farms in Bosnia and Herzegovina is composed mainly from farms up to 5 cows. According to Milkprocessing Sarajevo<sup>3</sup> in 2010 in Bosnia and

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<sup>3</sup> Milkprocessing Sarajevo Ltd – has provided consultancy and engineering services in the dairy industry and kettle farming since 1999. Based in Sarajevo. Milkprocessing represents in BH the Danish Company Chr.Hansen, which produces natural ingredients for the food and drink industry. Chr.Hansen is a leading producer of microbiological cultures, including starters, probiotics, enzymes and natural colours used in dairy, meat and other food industries. Milkprocessing has successfully cooperated with Chr.Hansen since 2001 to serve the food industry in BH

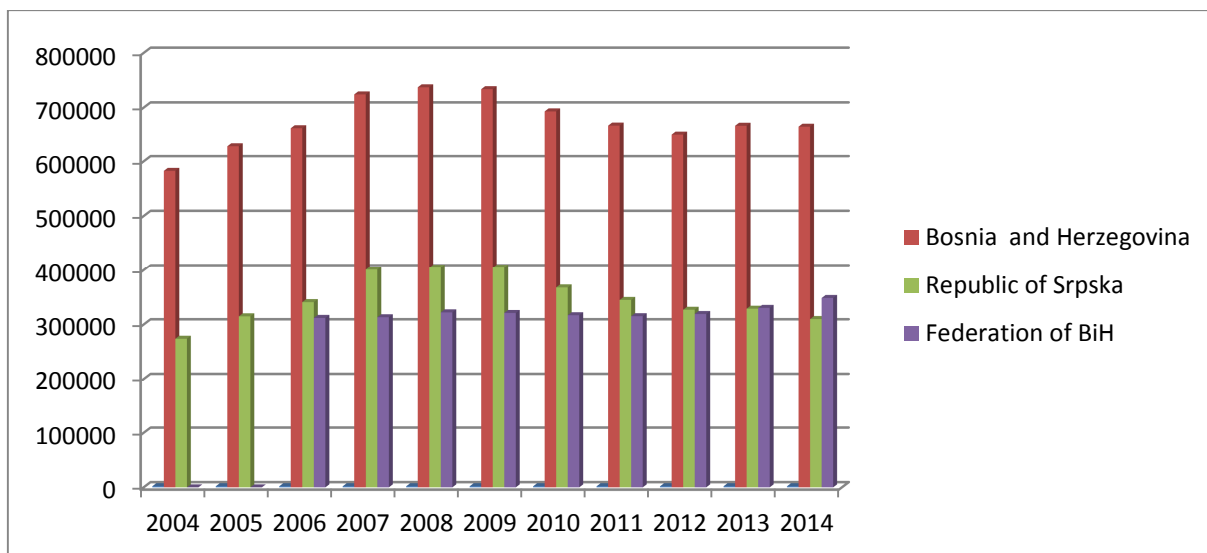
Herzegovina is estimated 18,360 farms of up to 5 cows. The average number of cows on the farms is estimated at 1.7 or 2 cows per farm. More than 80% of farms on average have two cows. It should be noted that the data listed in Table 3 include only farms that are market-oriented and produce milk for the market. It is also estimated that the total number of dairy cows in 2010. was 30,306 cows, with an average yield of milk per cow in the amount of 3,052 litres and the total milk production of 92 million litres. In the same year, the number of large farms is estimated at 8 with the total number of dairy cows 4,190, an average yield of milk 5,823 litres per cow and total production of 24 million litres of milk.

On the level of the two entities the structure of commercial milk producers is similar to the level of Bosnia and Herzegovina. In the Federation of Bosnia and Herzegovina farms of up to 5 cows in 2010 accounted for 82% of all farms, with 1.2 animals per herd, 11,186 dairy cows and a yield of 2,581 litres per cow, and a total production of 28,8 million litres of milk . The remaining 18% are market-oriented farms with more than 5 cows. At the level of the Republic of Srpska has been estimated small number of farms of up to 5 cows, 8,855 farms in 2010, an average of 2.3 animals per herd. In RS total number of dairy cows is bigger than in the Federation of BH. Number of cows in RS is estimated 18,910 and the average yield per cow from 3,320 litres, the total production of 62,8 million litres of milk.

**Table 3. Estimate of the number of dairy cows and market milk production (2011)**

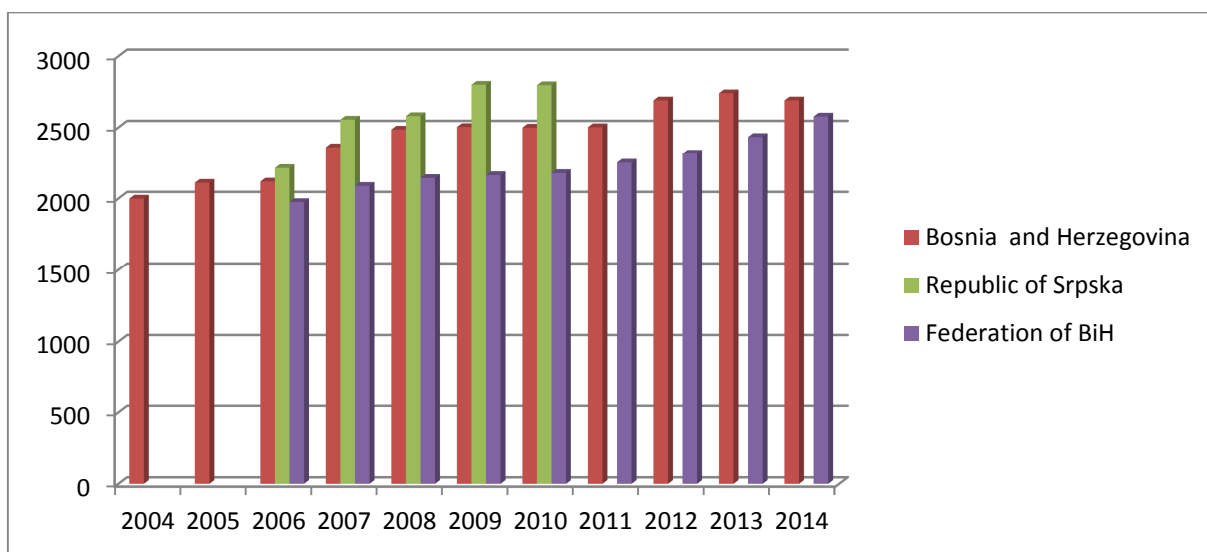
Farm size	Number of farms	Estimates of the number of cows		Estimates of milk production	
		Cattle per farm	Total number	Litres per cow	000 lit
<b>FBiH</b>					
To 5 cows	9322	1,2	11186	2581	28807
5-10 cows	1505	5	7525	3500	26337
10-20 cows	404	11	4444	4000	17776
20-200 cows	150	22	3300	4500	14850
Total	11381	2,3	26455	3318	87770
Big farms	5		1920	6250	12000
In total	11386		28375	3517	99770
<b>RS</b>					
To 5 cows	8855	2,3	18910	3320	62840
5-10 cows	882	5	4410	3500	15435
10-20 cows	266	11	2926	4000	11704
20-200 cows	97	22	2134	4500	9603
Total	10100		28380	3508	99582
Big farms	3		2270	5462	12400
In total	10103		30650		111982
<b>BD</b>					
To 5 cows	183	1,4	210	2533	532
5-10 cows	58	5	290	3500	1015
10-20 cows	13	11	143	4000	572
20-200 cows	5	22	110	4500	495
Total	259		753	3471	2614
Big farms					
In total	259		753	3471	2614
<b>BiH</b>					
To 5 cows	18360	1,7	30306	3052	92179
5-10 cows	2445	5	12225	3500	42787
10-20 cows	683	11	7513	4000	30057
20-200 cows	252	22	5514	4500	24948
Total	21740	2,6	55588	3455	189966
Big farms	8		4190	5823	24400
In total	21748		59778	3586	214366

Source: Milkprocessing Sarajevo



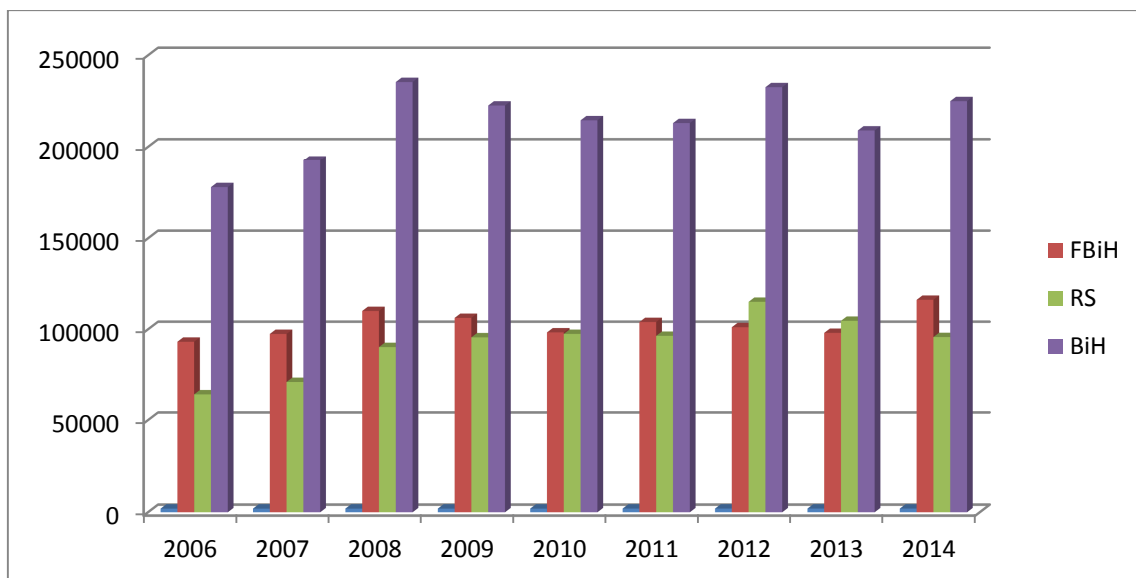
**Figure 2 - Total production of milk in BiH, RS, FBiH (2004-2014)**

Source: Agency for statistics of BiH, Federal office of Statistics FBiH, Institute of Statistics RS



**Figure 3 - Average yield per cow in litres in BiH, RS, FBiH (2004-2014)**

Source: Agency for statistics of BiH, Federal office of Statistics FBiH, Institute of Statistics RS



**Figure 4 - Purchase of milk (000 of litres) in BiH, RS, FBiH (2004-2014)**

Source: Agency for statistics of BiH, Federal office of Statistics FBiH, Institute of Statistics RS

### 4.3 Recent history of the milk processing

Here author represents brief history of milk research referring to FAO research.<sup>4</sup>The agricultural processing industry suffered severely during the Balkan conflict in the 1990s.

- The raw material base from milk producers was fragmented, forcing many dairies to import milk powder for recombination in order to keep the market supplied;
- The meat industry also suffered damage and destruction of many factories with livestock almost decimated, numbers and practices have still not recovered, witnessed by the continuing dependence on meat imports;
- Dairies in Bihać, Mostar and Sarajevo in particular were damaged;
- Due to the raw material shortage, the dairy product range was confirmed mainly to pasteurized milk, which is simpler to process;
- Many transport vehicles were destroyed and damaged, further hindering the collection of such raw materials that was still available on farms;

<sup>4</sup> The Meat and Dairy Sector in Bosnia and Herzegovina; Preparation of IPARD Sector Analyses in Bosnia and Herzegovina; FAO; p. 73.

Post-war development of dairy industry can be divided into three phases:

- I. Until 2000. Most dairies had recovered their pre-war status and new dairies were established;
- II. In the next phase up to 2005. Was time of gradual modernization and expansion of processing capacity. Furthermore privatization of former state-owned plants was mainly completed;
- III. From 2005 onwards foreign companies have invested in dairies in Bosnia and Herzegovina, mainly in the larger enterprises. Investments from Germany, Slovenia and Serbia; new varieties of existing products such as yoghurt, together with the production of Feta-type cheese. This phase met the closure of many dairies, mostly of small capacity and limited technology. Moreover there is significant increase in investment by local entrepreneurs, in new buildings, plant and technology.

### **Milk collection and transport**

There are three main ways in which milk gets from farms to formal dairy processors:

- 1) Direct collection by the dairy
- 2) Delivery by the farmer to a nearby milk collecting centre
- 3) Collection by middle men
  - 1) Direct collection by the dairy

Direct collection in which milk is sampled and collected directly from milk cooling tanks on farms daily by the dairies.

- 2) Milk collecting centres

Small dairy farms take their milk in churns (a machine or a container) to a nearby milk collecting centre owned by dairy, where milk after acceptance is being weighed, sampled, and poured into the tank for daily collection by the dairy.



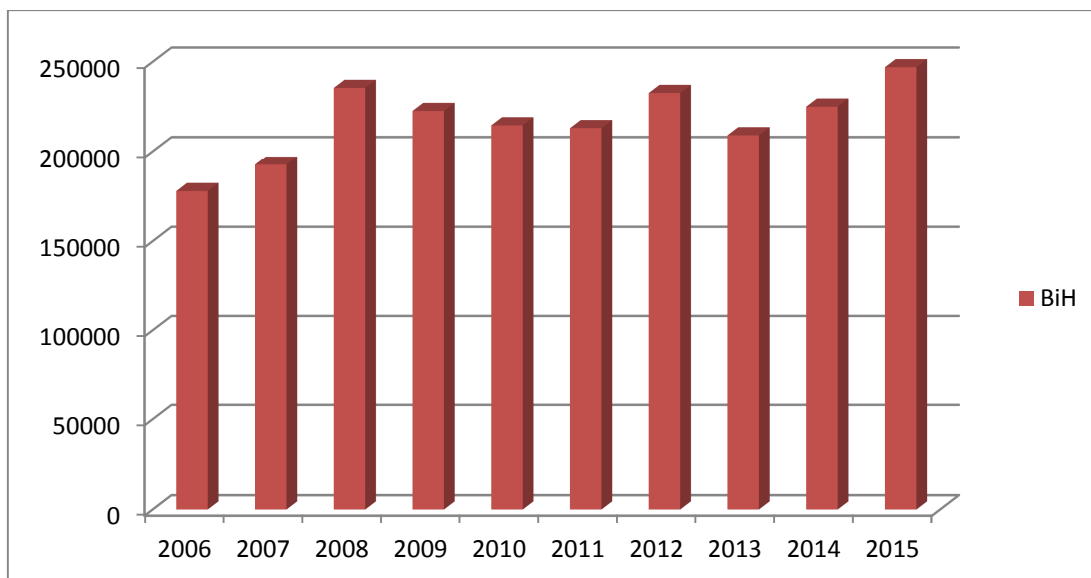
### 3) Collection by middlemen

Middlemen collect milk in churns from producer and transport it to dairies. There is no confirmation that registered dairies receive any milk from middlemen and it seems that most of the milk collected in this way is delivered to small, unregistered dairies, typically processing less than one tone of milk per day.

## **4.4 Milk processing- Milk industry in Bosnia and Herzegovina**

Recent official data and Agricultural report in Bosnia and Herzegovina 2014, reported following situation in this sector. In Federation of BiH in 2014 operated 24 dairies which capacities for milk processing amounted 332.000 thousand of litres of milk. Utilization of capacity for the processing is about 38.7%. The total production of milk and dairy products in 2014 amounted to 128,511 tons, as compared to the previous year more for 27%. In relation to the production achieved in 2013, in 2014 has been registered an increase of consumption of milk by 28% and reducing the production of cream for 7%. Production of fresh cheese remained at the same level of 1890 tons as well as the previous year, while production of other cheeses (semi-soft) amounted to 1,420 tonnes and increased by 28% compared to the previous year, when it produced 1,112 tons.

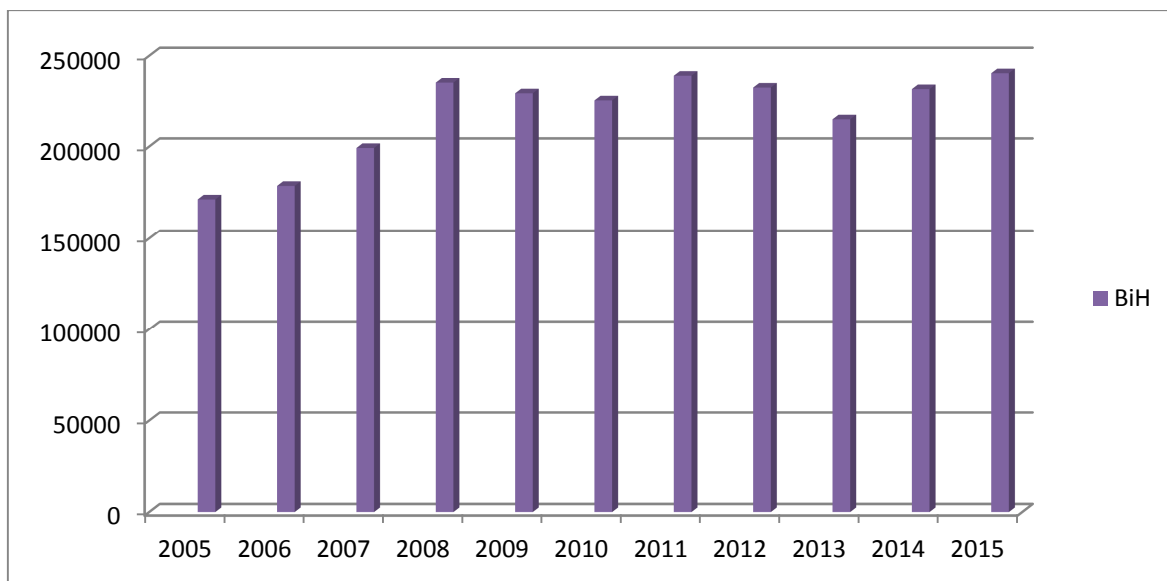
According to the records of registered processors, entity of Republic of Srpska has a total of 13 dairies, and it's estimated that in 6 dairies daily production process takes place. The main and the largest processor of milk in RS, the Mlijekoprodukt, Kozarska Dubica, in the period of 2014 bought 40 million liters of milk from farmers. Dairy Pađeni d.o.o Bileca in function bought about 4 million litres of milk. Compared to the average monthly production achieved in 2013 there has been registered a decrease of production of processed consume milk by 0.7%, butter and other yellow fatty products about 45.4%. In the same time there has been recorded an increase in the production of fermented milk product of 5.2%, cottage cheese by 11.6% as well as the production of cream by 31.5%.



**Figure 5 - Purchase of milk by dairies in Bosnia and Herzegovina (000 litres) (2006-2015)**  
 Source: Agency for statistics of BiH; Milkprocessing Sarajevo

Figure 5 shows purchase of milk by the dairies in the period from 2005 to 2015. Purchase of milk from farmers gradually increased during this period. In 2006 purchase of milk amounted to 177,727,000 liters, and purchase increased until 2008, when it stood at 235,437,000 liters. From 2009 to 2011 purchase of milk by dairies decreased in comparison to 2008, in 2009 by 5.5%, and in 2010 and 2011, by 11%. The minimum purchase of milk was recorded in 2013 (209 million), while the biggest purchase was recorded in 2015 and amounted to 247 million liters of milk.

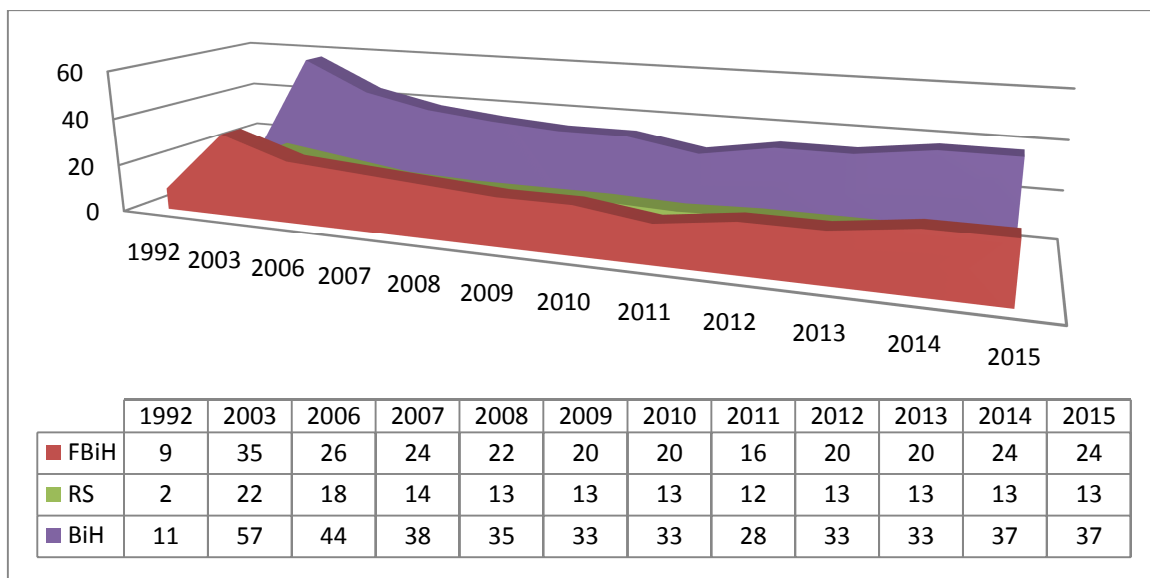
On the other hand milk processing is shown on Figure 6. Since 2005, when it was processed 171,400,000 liters of milk and milk processing increased until 2008, when dairies processed, 235,345,000 liters of milk. In the next period after 2008 the minimum amount of processed liters of milk has been recorded 2013, 215,339,000 liters of milk. While according to official statistics, in 2015 has been recorded the maximum amount of processed milk 240,468,000 liters of milk.



**Figure 6 - Processing of milk in Bosnia and Herzegovina by dairies (000 litres) in period 2005-2015**

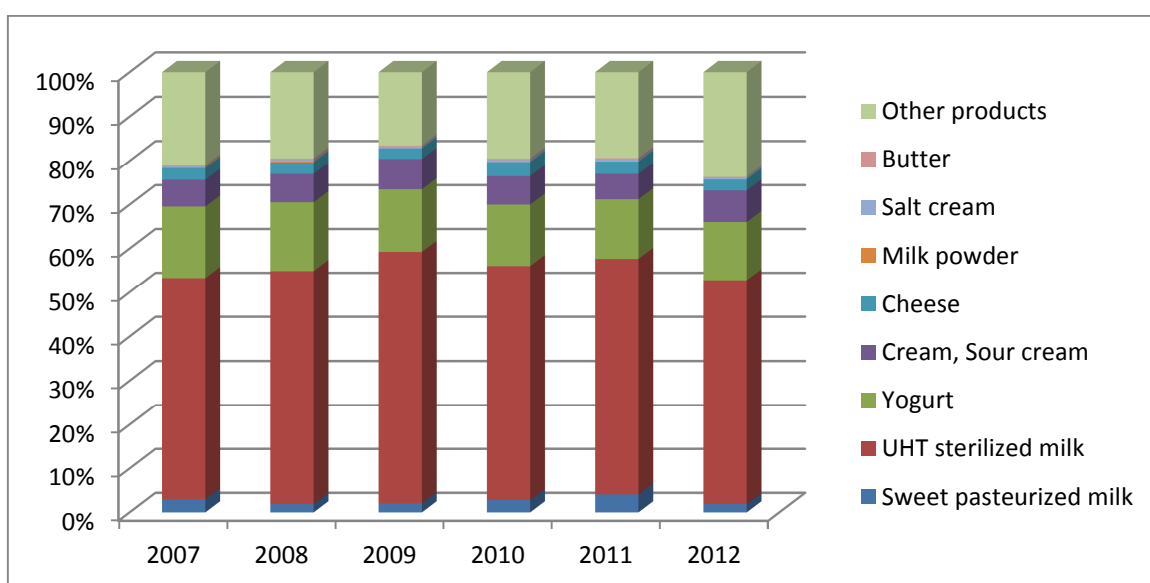
Source: Agency for statistics of BiH; Milkprocessing Sarajevo

Furthermore the number of dairies in the same period varied. As presented in the Figure 7 number of dairies has increased in comparison to 1992, and in 2003 in Bosnia and Herzegovina had been registered 57 dairy plants, 35 of which in the area of the Federation of BiH and 22 dairies in the Republic of Srpska. What is according to official statistics largest number of dairies. Thereafter the number began to decrease at 44 in 2006, 33 in 2009 and 28 dairies in 2011. In the following period between 2012 and 2015 the number of dairies has varied and about 30 dairies operated continuously and which have been registered. On the market also operate small family dairies focused on local market and markets of smaller municipalities and regions (i.e. Cantons). Data show that in 2015 in Bosnia and Herzegovina were registered 37 dairy plants, of which 24 in the Federation and 13 in the Republic of Srpska, out of which according to official sources, six dairy works by the availability of raw materials and seasonal. Therefore it could be said that in total about 20 dairies operate in FBiH and 7 in RS, what makes total 27 dairies in Bosnia and Herzegovina in 2015.



**Figure 7 - Number of registered dairies in Bosnia and Herzegovina (1992-2015)**

Source: Agency for statistics of BiH; Milkprocessing Sarajevo



**Figure 8 - Structure of milk processing in Bosnia and Herzegovina (2007-2012)**

Source: Milkprocessing Sarajevo

The structure of dairy processing in Bosnia and Herzegovina is dominated by liquid program, Figure 8 shows the percentage share of milk products from total processed milk in Bosnia and Herzegovina from 2007 to 2012 year. Furthermore share of pasteurized milk decreased in the structure of production over the period from 3% in 2007 to 1.9% in 2012. On the other hand the biggest share in the production UHT sterilized milk, has about 50% and production increased in the period from 2007 by

2009, from 50.2% to 56.9%. Thereafter share began to decline from 2010 to 2012, from 53.2% to 50.9%.

Cheese production although still insufficient varies about 3% and slightly increased in the same period over 3% according to data from Milkprocessing. Production of yogurt slightly inclined, and the share in production declined from 16.3% in 2007 to 13.3% in 2012.

**Table 4-Production of milk products in dairies in BiH (2007-2015)**

Product	Unit	2007	2008	2009	2010	2011	2012	2013	2014	2015
Sweet pasteurized milk	000 l	5,900	4,454	4,853	6,359	9,824	4,336			
UHT sterilized milk	000 l	100,027	124,679	130,656	119,974	128,065	110,8411			
Yogurt	000 l	32,546	36,893	32,494	31,613	32,434,6	31,012	27,634	30456	38036
Cream, Sour cream	t	12,151	15,386	15,868	14,571	139,688	16,726	18,703	20166	23177
Cheese	t	5,265	6,059	5,623	7,317	6,714	5,739	4,652	5450	6221
Hard and Semi hard	t	1,965	2,540	2,004	1,725					
Fresh cottage	t	2,902	2,435	3,284	4,527					
Feta	t	212	752	335	1,065					
Other	t	186	332							
Milk powder	t	434	361	0	13	0	0			
Creams	t	654	977	880	1,141	1171	1076,7			
Butter	t	440	654	520	729	599,5	306,5	564	491	750
Processed milk	000 l	199,198	235,339	229,513	225,646	239104,4	232652			

*Source: Milkprocessing Sarajevo, Agency for Statistics of BiH*

In Table 4 production of pasteurized milk in Bosnia and Herzegovina increased in the period 2007-2011, after which it began to decline. On the other hand the production of UHT milk has grown since 2007 and in 2009 amounted to 130,656,000 liters, thereafter it began to decline. In the same period the production of yogurt grew and at the same time varied over the period 2007 to 2015, however in 2015 has been recorded the largest amount of 38,036,000 litres of yogurt produced.

Cheese production measured in tons, increased from 2007 to 2010, 5,265 to 7,317 tonnes. After in 2013, there was a slight decline in production and in the same year was

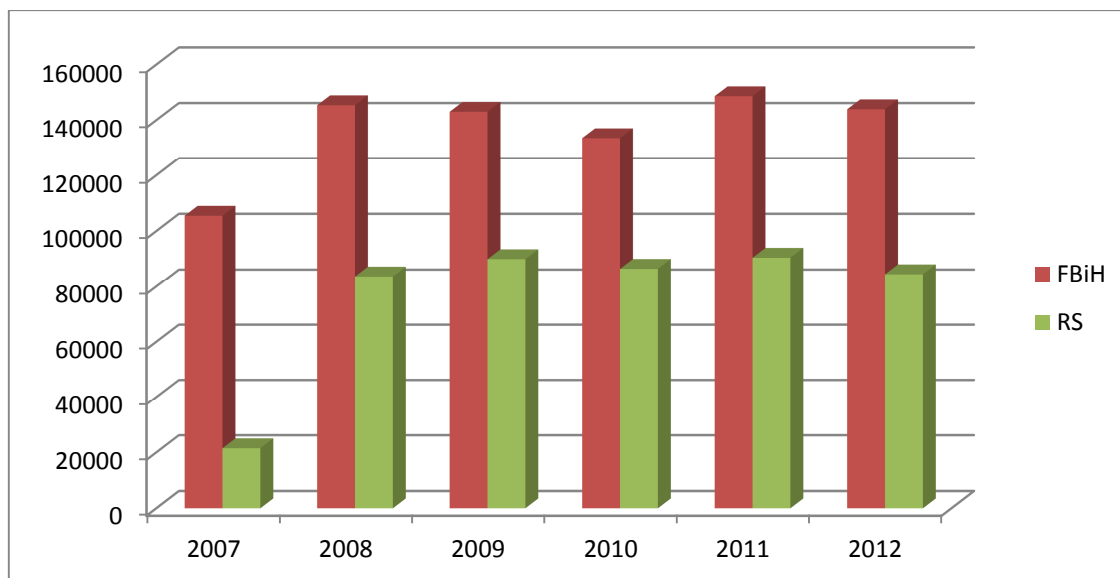
produced 4,652 tons of cheese, 2015 production rised and amounted to 6,221 tons. The largest share according to data within the production is of Fresh cottage cheese, which production increased in the period from 2007 to 2010. Production of creams and butter as well recorded an increase in production.

**Table 5 - Production of milk and milk products in 2014**

Product	U n	Quantity produced	Sold and transported quantity
Milk and cream 1%	kg	2,199,163	2,205,012
Milk and cream 1-6%	kg	188,598,583	136,568,009
Milk and cream 6-21%	kg	10,155,741	9,959,576
Milk and cream >21%	kg	3,498,871	3,493,026
Butter <85%	kg	262,892	216,783
Butter >85%	kg	45,280	34,760
Milk spread <85%	kg	636,295	636,632
Cheese	kg	5,653,654	5,305,523
Jogurt, cream and other fermented products	kg	37,298,312	37,329,617
Flavoured liquid yoghurt or sour milk	kg	1,905,822	1,905,889
Whey	kg	246,777	244,309
Milk products	kg	1,806,635	1,803,142
Ice-cream	kg	528,843	507,390

*Source: Agency for Statistics of BiH*

Table 5 shows complete data from Agency of statistics in production of dairy products in 2014. Table 4 and 5 only differ in expressed units (tons and kilograms) and milk is presented according to fat content. And additionally in third column is quantity transported and sold. As well produced quantity of ice-cream for 2014, which was 528,843 kilograms.



**Figure 9 - Milk processing in Federation of BiH and Republic of Srpska (000 litres)**

Source: Agency for statistics of Bosnia and Herzegovina

Milk processing in the Federation of BiH and the Republic of Srpska is presented on Figure 9 in the period between 2007 to 2012 in FBiH processing of milk has increased, from 105,485,000 in 2007 to 143,950,000 liters of processed milk in 2012. In the Republic of Srpska milk processing in the same period is lower than in the Federation of BiH and rose from 21,500,000 in 2007 to 89,947,000 liters in 2009. Largest increase was in 2011 when 90,450,000 liters of milk was processed.

**Table 6 - Production of milk products in dairies in Federation of BiH (2006-2014)**

(tons)

FBiH	2006	2007	2008	2009	2010	2011	2012	2013	2014
Milk	62,835	64,721	79,936	80,154	79,112	79,188	80,614	98,081	103,590
Milk powder	340	411	291	3	12	15	10	29	0
Butter	387	307	512	432	400	394	319	833	774
Cheese	1,635	1,952	2,569	2,794	2,891	2,418	2,972	3,106	3,710

Source: Federal office of Statistics FBiH

Table 6 presents data on the production of dairy products in the dairies of FBiH in the period 2006-2014 year. In 2006 production amounted to 62,835 tons, while in 2014, according to data was produced 103,590 tons of milk. What is the increase in production over a period of eight years in the amount of about 39%. Production of milk

powder is in decline, according to statistics in this period. On the other hand production of cheese increased in this entity and in 2014 has been recorded the highest amount of cheese produced 3,710 tons, as compared to 2006, production increased by 55%. Although the production of butter varied, there was significant growth in 2013 and 2014 compared to the previous period.

**Table 7 - Production of milk and milk products in Federation of BH (tones)**

Product	2014	2015
Milk	90,885	87,439
Cream	14,748	16,145
Fermented milk products	21,421	24,981
Butter	453	548
Kaymak	104	242
Cheese	3,834	4,074
Cow	3,817	4,040
Soft cheese	1,051	716
Semi soft	85	82
Semi hard	822	613
Hard cheese	516	880
Fresh cheese	1,358	1,781

*Source: Federal office of Statistics FBiH*

Table 8 presents the recent official data about production of milk and milk products in Federation of BH. Overall there has been decrease of milk production from 2014 to 2015, by 3,8%. Cheese production in this entity increased in 2015 by 5%. Biggest production of cheese is cow cheese and this production amounted about 4040 tones in 2015. Production of cow cheese increased by 5,5%. Production of soft cheese decreased in 2015 from 1,051 to 716 tones. As well as production of semihard cheese decreased in 2015, from 822 to 613 tones. Production of hard cheese increased in 2015 from 516 to 880 tones. There was an increase in production of fresh cheese from 1,358 tones to 1,781 tones in 2015. Overall it could be said that production of cheese increased slightly in FBiH in 2015.



**Table 8 - List of Dairies in Federation of BiH (2015)**

Dairy	Tonnes per year	Litres per day	No of farmers	Liters per farm per day
1 Meggle Bihać	37,398	117,800	3,200	37
2 Inmer Gradačac	26,014	71,271	931	77
3 PPM, Tuzla	18,197	49,855	2,363	21
4 Milkos Sarajevo	16,542	45,321	820	55
5 Mljekara Livno	8,978	24,597	810	30
6 ZIM Zenica	5,829	15,970	1,235	13
7 Tippas Posušje	3,906	10,701	250	43
8 Poljorad Turbe	3,067	8,403	520	16
9 Puđa Livno	4,007	10,980	350	31
10 Saraj-Milk Maglaj	1,743	4,775	170	28
Agrocentar Gornji				
11 Vakuf	1,650	4,521	249	18
12 Milk-San Sanski most	1,608	4,405	120	37
13 Movita Mostar	1,585	6,500	1	6,500
14 Milchproduct Čelić	1,360	3,726	186	20
15 Noćkokomerc Živinice	2,409	6,600	350	19
16 Sirko Gračanica	780	2,137	120	18
Mlijekoprodukt				
17 V.Kladuša	278	762	65	12
18 Promilk Prozor	220	603	41	15
19 Mljekara Kupres	80	219	30	7
20 Jezerka Jezersko	278	762	55	14
21 Vita Vi Gabela polje		5,180		
22 Suša Livno		1,589	150	
23 Vlašić-Milk Karalula		1,095		
24 Eko Milk Begov Han				
25 Yo Vita Busovača				
<b>TOTAL</b>	<b>135,929</b>	<b>389,908</b>	<b>11,866</b>	<b>49</b> (excluding #13)

Source: Dušan Loza et al.

Table 8 represents the list of registered dairies in the Federation of BiH, and in 2015 has been registered 24 dairies in the Federation. Biggest dairies in this entity are Meggle Bihac, Inmer Gracanica, PPM Tuzla, Milkos Sarajevo and Dairy Livno.

**Table 9 - List of dairies in RS (2015)**

Dairy	Tonnes per year	Litres per day	No of farmers	Liters per farm per day
Mlijekoprodukt				
1 Koz.Dubica	50,608	138,652	3,287	42
2 Natura-Vita Teslić	22,070	60,466	2,032	30
3 DTD Njegotina	9,675	26,506	1,154	23
4 Pađeni Bileća	2,557	7,005	401	17
5 Dule Bijeljina	2,278	6,241	200	31
6 Milko Prijedor	2,190	6,000	340	18
7 Mljekara Šipovo	1,137	3,115	320	10
8 Bianca Zvornik	1,128	3,090	290	11
9 Glogovac Nevesinje	929	3,720	110	34
10 Perfeto Nevesinje	520	1,700	60	28
11 Dramon Pale	210	575	7	82
12 Četković Rudo	202	553	68	8
13 Maja Gacko	168	460	56	8

Source: Dušan Loza et al.

Dairies Meggle, Inmer, PPM, Milkos, ZIM and Livno dairy have the highest number of sub-contractors or farmers from who they purchase milk. Number of farmers, from whom the first six dairies on the list purchase milk is around 6500, what is daily around 325,000 litres of milk. Small family dairies that are market-oriented and work seasonal are following dairies shown in Table 8 Yo Vita Busovaca, Dairy Sčipe and Agropod Odžak.

In RS there 13 dairies are registered, 6 of which is in continuous milk processing according to official data from 2015 year. The biggest dairies as can be seen in Table 9

are Mlijekoprodukt Kozarska Dubica with daily milk processing of 138,652 liters of milk; Dairy Natura-Vita Teslic that daily processes 60,466 liters of milk and DTD Njegotina with daily processing of 26,506 liters of milk. These three dairies buy milk from about 6,500 cooperatives / farmer.

#### **4.5 Description of dairy production program**

##### 1) Meggle Bihac –

Is second biggest dairy in Bosnia and Herzegovina. Production program is consisted of next products:

- Long life milk (UHT) due to the production process does not need to be stored in a cooling refrigerator and thanks to the same process and packing material all its valuable ingredients are preserved.
- MEGGLE UHT milk is produced in five different fat contents: 3.2%, 2.8%, 2.5%, 1.5% and 0.9%.
- Ladyrange Milk 0.9% mw 1 lit. is rich in calcium and vitamins with very low fat. Ladyrange Milk makes a special line of dairy products, which helps maintain good health and slenderness.
- Meggle Milky Max 3.2% m.m 1 liter.
- Winter Edition Mlik 3.2% m.f. 1 lit
- UHT Milk Coffee 3.8% 1l, standardized fat milk is rich in calcium and vitamins.
- MEGGLE Strawberry milk 2.0% fat 330 ml
- MEGGLE Vanilla milk 2.0% fat 330 ml
- UHT Coffee milk 3.8% 1l, standardized whole milk is rich with calcium and vitamins.
- MEGGLE sour cream is a fermented product, high in quality and 'pure', without any kind of stabilizers or preservatives. Sour cream is differentiated by fat content (12% and 22% milk fat) and by different packing materials (180g, 410g and 850g) and it can be used direct from the package. You can add it to fresh cheese or during cooking

- Butter is a natural product without any preservatives, that contains a number of valuable ingredients necessary for the normal function of body cells; vitamins A, D, E and K and also saturated and unsaturated fatty acids.
- Yoghurt – drink yogurt 2,8% m.f. 180ml/330ml/1L; drink yogurt 0,9% m.f. 1L; liquid yogurt 2,8% m.f. 0,5l/1,5 lit –Family pack; liquid yogurt 0,9% m.f. 330ml/0,5 lit; Thick yogurt 3,2% m.f. 180 ml; Meggle yogurt 2,8% m.f. 850g; meggle probia 1,5% fat 1lit/330 ml; Kefir 2,8% 180ml/330ml/1lit; Fruity yogurt 2,8% fat sour cherry,fat strawberry,fat forest fruit, fat peach 150g; Fruity drink yogurt 2,8% fat strawberry,blackberry,fat sour cherry 330g; Fruity yogurt 2,4% fat strawberry, fat forest fruit 850g +50g; Meggle sour milk 370g;
- Cheese and spreads – Fresh cheese 15% fat 450g; Sliced melted cheese Cheddar/Toast 150g; Melted Cheese BelAmi mix/natur 140g; Mozzarella 125g/1kg; Cottage Cheese; Cheese kriska 40% m.f.; Fresh Cheese 10% fat 450g – LIGHT; Fresh cheese with cream 450g; Sliced melted cheese Emmentaler 150g; Vajkrem 22% m.f. 100g; Vajkrem 40% m.f. 200g; Vajkrem 20% m.f. 200g – Light; Vajkrem with herbs 200g; Kajmak 65% m.f. 200g; Vajkrem Baked Cheese, Baked Chives, Baked Pizza 180g;
- Cooking cream 10% m.f. 500ml/200ml+50ml Gratis; Cooking cream 20% fat 500ml/1lit; Cooking cream 20% m.f. 200+50ml Gratis/300ml; Meggle Thick cooking cream 20% m.m 1lit
- Mileram 22% m.f. 400g/850g; Mileram 30% m.f. 400g/850g;
- Desserts – JoBu desert strawberry,desert peach 1% m.f. 150g; Meggle desert stracciatella/vanilla family pack 700g; Milky Max milk desert with chocolate and hazelnuts; Panna Cotta 10% 1liter; Pudding chocolate 4x125g
- Whey – natural whey 0,1% fat 1lit; Meggle whey strawberry and cranberry, orange and passion fruit 330ml

2) Mlijekoprodukt – is the largest raw milk processor in Bosnia and Herzegovina. It is one of the leading milk and dairy companies and the largest exporter in the country. Production program includes:

- Vitalia products: Vitalia UHT milk 1,5%/2,8%; Vitalia milk 2,8% mm 1,5lit; vitalia yogurt 0,5%/1,6%/2,8%/2,8%elopak; vitalia set yogurt 850g; vitalia kefir; vitalia sour cream 12%/20%/21%; vitalia cooking cream;

- Moja kravica: Moja kravica long-life milk 0,5%/1,5%/2,8%; Moja kravica milk 2,8 mm 1,5lit; Moja kravica long life milk A+D3 vitamins, lactose free long-life milk, chocolate milk, milk shake strawberry, milk shake vanilla, yogurt; Moja kravica curdled milk 2,8%; Moja kravica sour cream 20% milk fat; Moja kravica sour cream 12% milk fat; Moja kravica homemade sour cream 25% m.m.; Moja kravica neutral cream for cooking; Moja kravica fresh cheese; Moja kravica Dairy spread Classic 150g; Moja kravica dairy spreads dill and garlic; Moja kravica butter;
  - Balans+; Balans+ meal; Balans with wheat and wheat germ; Balans+ Probiotic white cheese;
  - Natura: UHT milk Natura milk 2% fat; Yogurt Natura milk 1%/2,8% fat; Natura milk sour cream 12%/20% fat;
  - Joogod cup strawberry, sour cherry, forest fruit; Joogod sour cherry; Joogod strawberry, apricot, forest fruit, raspberry;
  - Grekos yogurt, yogurt strawberry, yogurt apricot, grekos cheese;
  - Subotica's kajmak, Šumadinka melted cheese, Bello organic long life milk;
- 3) Milkos Sarajevo – Sarajevo, dairy plant is the oldest producer of milk and dairy products in Bosnia and Herzegovina.
- Milk: Milk 2,8% m.m. 1lit; Milk 3,2% m.m. 1 lit; Milk 1,5% 1lit; Milk 0,9% 1lit; Farma milk 2% fat 1,5lit/1lit; Milk Drink 2,8% m.m. 1lit;
  - Kefir - Kefir 2,8% m.m. 1lit/0,5lit/180g
  - Jogurt – Farma Jogurt 1,6% m.m 1,5L/1L; Farma Jogurt 3,2% m.m 1L; Liquid yogurt 2,8% m.m 1L/0,5L/180g; Liquid Yogurt 2,0% m.m 1L/0,5L/180g; Jogurt Light 0,5% m.m 1L/0,5L, Jogurt Horeca 2,0% m.m 170g;
  - Cream 30%/22% m.m 850g; Sour cream 20%/12% m.m 850g; Farma cream 12% 850g; Creamy 20% m.m 850g; Cream 30%/22% m.m 400g; Sour cream 20%/12% m.m 400g; Creamy 20% m.m 400g; Sour cream 20%/12% m.m 180g
  - Half-fat fresh white cheese in brine made from unpasteurized / pasteurized milk ultrafiltered. Minimum 20% of dry matter. At least 20% milk fat in dry matter. Cheese 250g; Full-fat soft white cheese in brine made from unpasteurized / ultrafiltered pasteurized cow's milk with at least 45% milk fat in dry matter.

Feta cheese 500g/250g; Minimum 18% of dry matter. At least 20% milk fat in dry matter. Fresh cheese 900g/450g; Milk spread. Vajkrem 200g/100g/50g.

- Ayran 2,8% m.m 230g;
- 4) Mljekara Livno – some programmes in dairies such in Mljekara Livno are focused only on cheese production. This is one of the biggest cheese producers in Bosnia and Herzegovina and Livno cheese is their best known product and indigeneous product of Bosnia and Herzegovina;
- Livno cheese<sup>5</sup> - full-fat hard cheese for cutting 45-60% of milk fat in the dry matter of cheese, with 49-56% of water in the dry matter without fat cheese, about 2% salt. Ripens under the choir in a natural way. Products from cow's, sheep's or a mixture of cow's and sheep's milk, in rolls about 2.3 and 3.3 kg. Ripens under the choir at least 80 days and preferably more. For 1 kg of cheese is necessary 12 to 13 liters of milk.
  - Trappist is a semi-hard fat cheese for slicing with 45-60% fat in the dry matter of cheese, with 54-69% of water in the dry matter without fat cheese, about 1.8% salt. It is produced in rolls about 2.3 kg. Ripens under the choir 30- 40 days.
  - Cincar the fat semi-hard cheese for cutting by 45-60% fat in the dry matter of cheese, and 54-69% of water in the dry matter without fat cheese, about 1.9% salt. It is produced in rolls 2 kg. Ripens under the choir for at least 40-50 days
  - Livanjska Feta is a soft full-fat cheese (block) with 45-60% fat in the dry matter of cheese, more than 67% of water in the dry matter without fat cheese and approximately 4.0% salt. The shape of the cheese block, produced in two sizes Unit 6 kg and 3 kg and packed in 0.5 kg.
  - Edam is a lightweight, full-fat cheese for slicing with 25-45% fat in the dry matter of cheese, with 54-69% of water in the dry matter without fat cheese and approximately 1.8% salt.

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<sup>5</sup> Place of origin of Livno cheese is an area of southwestern BH, the wide area of Livno polje from where it's production spread to areas of Glamoč and Tomislavgrad. Originally was produced from sheep milk per recipe of Swiss Gruyere cheese and production started in 19th century. The smell of cheese is typical for kras cheeses. The taste is full and pleasing and somewhat spicy in older cheeses.

- Gouda is a semi-hard fat cheese (block) with 45-60% fat in the dry matter of cheese, with 54-69% of water in the dry matter without fat cheese, and approximately 1.8% salt;

5) Poljorad Turbe - located geographically under the Vlašić mountain, town of Travnik, famous for its eponymous Travnik cheese<sup>6</sup>. Production program includes following products:

- Soft cheese - Travnik cheese - Soft full-fat cow's/sheep's milk cheese;  
Ingredients: milk, dairy culture, table salt to 5%. Dry matter min. 45%. Milk fat in dry matter min. 45%; Travnik white feta 200g/400g/600g  
Ingredients: milk, dairy culture, table salt up to 2%. Dry matter min. 34%. Milk fat in dry matter min. 45%;
- Semi-hard cheese – livadski cheese 400g/1-1,5kg ; Travnik Zlatnik Soft full-fat cow's milk cheese;
- Smoked cheeses – Dimko - Smoked fat semi-hard cheese made from cow's milk;  
Ribanac Smoked cheese from skimmed cow's milk;
- Melted cheeses – Topsi; Travnicanka 100g
- Low-fat cheese – young low fat cheese; fresh cheese;
- Spreads – Cheese spread; Kajmak 100g/200g/500g/
- Butter 250g

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<sup>6</sup> An important influence in the development of animal husbandry in BH and in processing of milk, came throughout the history from the peoples who had lived in this area primarily from the Illyrians, Slavs and Vlachs. Vlasic cheese after Vlasic mountain is widely known as one of the best white cheeses in souse/whey. Indigenously it is made from sheep milk.

## **5 FROM FARM TO TABLE - TECHNOLOGICAL MATERIAL FLOW**

For this section on technological flow of material, from farm to table, particularly technological processing refers to following authors mentioned below.<sup>7</sup>

### **5.1 The formation and getting of milk on farm**

Udder is organ for secretion of milk.<sup>8</sup>Milk is produced in the mammary cells that are found in milk alveoli. The milk from the udder is obtained by milking that can be done manually or mechanically. Regardless of the method of milking, it must be done correctly in order to maintain the mammary gland in constant activity so it could be possible to milk from udder the largest possible amount of milk.

Milking includes:

- i. preparatory work
- ii. milking
- iii. finishing work

These operations are carried out hand milking and in mechanical milking and they are different. Mechanical milking is a modern way of getting milk. It is performed on farms with larger number of cows. Devices for milking can be movable and immovable. There are also smaller mobile portable devices, usually on a cart with a small number of milking units (1-2) or the milk pipes installed system, where the built-in vacuum tubes that carry milk to a special unit, where milk passes through the refrigerator and into the pools of milk.

Another type of device is used in special rooms that are used only for a milking - parlor. In milking parlors the cows spend just as much time that is necessary for milking. It can be of various types but have the same working principle. Cows enter the

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<sup>7</sup> Zlatan Sarić „Technology of milk and milk products“, Faculty of Agriculture, Sarajevo, 2007; „Food industry, sector; Production and processing of milk“ official document, Sarajevo, 2008;

<sup>8</sup> Safe food dairy report - Raw milk – milk which has not been heated above 40<sup>o</sup> C or subjected to treatment which has an equivalent effect



walled part for milking, a worker washes the udder, milk the first drops of milk and put glasses on the udder.

The milk is cooled after milking usually at 4-6°C while recently the practice is 1-3°C. The microorganisms that get into the warm milk are reproducing in milk rapidly and therefore should be quickly cooled. Cooling is extremely important especially during the summer months. In the cooling tanks where the milk is transported within 48 hours, it must be cooled to 3-5°C.

The simplest way of cooling is with the well or running water (temperature around 10°C, particularly mountain areas). The cans with milk are dipped into a pool of water, and the lids should be semi-opened for airing of milk. The disadvantage of this method of cooling is that is slow. For better cooling can be used chilled water using ice or water coolers. Cooling milk in buckets with a special built-in appliances, based on the principle of water flow above the bucket, and in some devices the water flows through above buckets and the pipes that are placed in the bucket itself. For milk cooling with these devices can be used naturally cold water, the water that flows over ice or obtained from a device that cools water. Producers who have a higher amount of milk or collection points for more small producers, cool and stor with built-in devices for cooling pools (coolers).

Cooled milk after milking, especially the evening one, should be kept at an appropriate low temperature until delivery. Milk can be placed in a cold cellar temperature of 10-12°C and low temperature will be maintained. Cooled milk can be cover with a variety of materials or put in isolation cabinets. A better and safer way is to put milk in the fridge. The modern way of preserving milk is pools or coolers with built-in devices for cooling water that circulates between the double walls of the pool. This method of storage is typically used on larger farms or collection points. In the pool is a blender that mixes milk to balance temperature. Their capacity is such that the milk is cooled to +4°C for about 1 hour. They allow storage of the milk for more than 48 hours, collected from one or more producers. Larger farms are generally equipped with tube or plate heat exchangers. Pipe fridges consist of a system of parallel tubes which are inserted into a closed cylinder. Milk passes through pipes, a refrigerant is in free space outside.

Transport should be necessarily performed in truck-tankers made of stainless materials, which are equipped with devices for cooling and mixing of milk. Stirring and overall

handling of milk should be as gently and preferably in a closed system to prevent the touch of milk with the air and microbial contamination.

## **5.2 Process of milk processing - technological material flow**

Delivered milk to the dairy is necessary as soon as possible subject to the following procedures:

- i. filtering,
- ii. cooling,
- iii. heat treatment / pasteurization or sterilization,
- iv. picking and typing,
- v. homogenization,
- vi. deodorization.

The goal of treatment is to improve milk quality and durability, and also different types of dairy products. In dairy milk is delivered once a day, as mentioned so far there are several ways of delivery of milk from farmers to dairies, usually the delivery is done by tanks.

Milk is taken according to the following procedure. A sample of milk is taken to test the quality. Qualitative tests include determination of the acidity, the composition (fat, dry matter, protein) and hygienic characteristics. It is determined by measuring the amount of weight or volume. Measurement can be done by scale if the milk arrived at the dairy in buckets, or flow meter if the milk comes in cistern. Based on the results of these analysis are determined price of milk and milk is directed to a particular process of processing. Admission of milk must be done as soon as possible and should not last longer than 3 hours so as not to spoil the milk.

### **Purification**

The milk is then delivered to the balancing tank. From which the pump ejects milk to the treatment. Milk is purified of mechanical impurities by filtration and centrifugation. In Bosnia and Herzegovina is applied various performances of filters mechanical impurities and using screens for filtering milk and only in the biggest dairies are used

bakteriofuga. Purification contributes to the aesthetic appearance of the milk and the smooth execution of other operations in particular pasteurization and homogenization.

### Cooling

After purification the milk is cooled to +4°C. The cooling is done in the plate heat exchangers. These pasteurizers usually consisting of two sections, the first cooling is performed with tap water, and in the second with cooled water. The optimum would be that purified milk goes immediately to the thermal treatment but admission is shorter than the thermal treatment, and therefore the milk cools and goes into tanks. This creates a reserve to guarantee that there will be no delay in the thermal treatment. Dairies are so designed that the entire quantity of milk received on the same day is processed.

### Storage of raw milk

Raw milk is stored in tanks at +4°C. Capacity of tanks should be provided to enable the reception of all milk that comes in during the day in a dairy. The tanks are connected to the battery and continuously filled. While one is filled the second one opens tap automatically for filling while the tap on the first is closed.

In The tanks milk must be mixed to avoid precipitation of milk fat which is achieved by a stirring or by bubbling (better in the larger capacity tanks). The tanks must be thermally insulated and must have observation windows to see the level and behavior of milk in the tank. The tanks are filled from top or bottom. It is important to prevent foaming and creating of lumps in filling what happens when milk during the filling stroke of the milk surface in the tank. What is achieved by directing the milk to slide down the surface of the tank during filling.

### Separation of milk

The aim of the separation is to adjust the concentration of fat in milk or in the finished product centrifuged separators are utilized. The separation of milk fat is based on the difference in specific gravity of milk fat and other components of milk (0.93g/cm<sup>3</sup> to

1,032g/cm<sup>3</sup>). Globules of milk fat are easier to extract to the surface during storage of milk due to the force of gravity. By Action of centrifuged force separation of milk is being accelerated and modern construction of pasteurizer enables continuous and fully amortized course of this process. During separation fat must be in liquid form and for this reason milk before entering standardizator heats up to 45 to 50°C.

The new lines only part of skim milk goes into a homogenizer with sour cream. Or sour cream is only after homogenizer mixed with skim milk. This is done not to send all the milk in a homogenizer. Separation with natural stratification is used in the production of well-known indigenous cream now made only in home production and are not still used in industry.

### Heat treatment of milk

The objective of the heat treatment is legally prescribed heat treatment of milk in order to destroy all pathogenic and other bacteria in the milk. It is being utilized on the milk that dairies receive from farmers. In the application are two forms of heat treatment pasteurization and sterilization. They differ in temperature, time, specifics of implementation techniques.

#### a) Pasteurization of milk

Is heat treatment at temperatures up to 100°C. Process that is applied to the product in order to destroy pathogens and as much as possible to reduce the risk on health and to thermal processing cause minimal chemical, physical or organoleptic changes of the product. Except of the objective to destroy all pathogenic and saprophytic microorganisms part, it causes flocculation of whey protein and provides smooth development of starters. The main objective of pasteurization is to destroy pathogens and inactivate their enzymes.

Two types of pasteurization:

- i. Low pasteurization, 63°C- the milk is heated in a closed duplicators with built-in mixer. This method is not continuous and there is possibility of recontamination. Another method of taking a low pasteurization is pasteurization of milk in bottles. It is performed continually, closed bottles with conveyor is conducted

through the device with hot water where pasteurization is done and there is no possibility of re-infection.

- ii. High pasteurization, 72°C/ 15's - today exclusively used method of pasteurization in modern dairies. The way that pushed out the first because it is faster and better remain preserved thermosensitive substances (vitamin, protein) and physico-chemical properties of milk.

#### b) Sterilization of milk

Is heating of milk at temperatures over 100°C in order to destroy microorganisms. Pasteurized milk has a low viability because all the microorganisms are not destroyed and can't be stored at room temperature, for this reason for long-term milk's must be apply the regime of sterilization. The quality of milk has to be better than the one intended for pasteurization (hygiene, a small number of spores of microorganisms, acidity, must be fresh, thermostable).

Following types of sterilization are used

- a. In The packaging 110-120°C/ 10-40 min
  - b. In the flow, 130-150°C/ several seconds, (indirect and direct)
- 
- I. Direct sterilization – injecting of milk into steam or steam into milk. Admission, purification, cooling and storage of raw milk. From balasnog thin milk goes in the plate heat exchanger to preheat at 75°C. Preheating increases the thermal stability of milk, thereafter follows:
    - i. Standardization of milk fat
    - ii. Homogenization may be done: at the beginning of the heat treatment (after preheating to 75°C) and after cooling in vacuum chambers.
    - iii. Deodorization - As with pasteurization, using partial vacuum removes odors from milk.
    - iv. Sterilization - High-pressure pump, the milk is transported to the steam injectors in which the milk is injected steam raising the temperature of the milk (140-150°C /2-4s).

- v. Cooling. The milk is cooled in the plate heat exchanger, which gives off heat a milk inlet.
- vi. Fill and seal packaging. Sterilized milk goes into the buffer tank, then in machine for leakage. Packaging must be sterile, impermeable to gas and light, without smell and taste, and to stand up to heat and chemical treatment. The most commonly used cardboard packaging. The new packaging can be designed in a carton (tetrahedron) or tetra-brik (parallelepiped) and is intended for single use.
  - Storage and delivery. Sterilized milk is kept at room temperature (20°C). Sustainability is a 2 to 3 months.

## II. Indirect sterilization

Indirect sterilization flow is performed in plate or tubular heat exchangers. At indirect sterilization is important deaeration because gases in milk can cause uneven heat distribution in the raw material.

In most of these lines homogenization is at the beginning of the homogenization process.

## III. In packaging

In making of sterilization in packaging can be discontinuous in rotating autoclaves or continuously where the bottles are being transferred through sections of heating, sterilization and cooling. In this second mode of use of heat and energy is greater, and the quality of products better.

In addition there are other physical methods of sterilization, such as radiation (UV, microwave), which are very rarely used in industry of milk processing. Chemical methods of sterilization (acids and salts) are used only for the preservation of the sample for analysis in the quality control of milk or products.

Homogenization of milk - The objective of homogenization is to increase the stability of the emulsion of milk fat, or prevent separation of fat on the surface of milk, mutual agglomeration and capture on the vessel wall and package. Homogenization is the process of grinding and equalizing the size of fat balls (or with cream) under the influence of high pressure for greater stability of the emulsion. Homogenization the

milk is intended for long periods, or for the production of products intended for long periods (concentrated milk products).

### **5.3 Distribution of milk**

Distribution of milk is under control of dairies. It is organized in two ways:

- Direct distribution mainly organized by small dairies and partly by medium dairies focused on local market
- Distributors under contract focused on regional market of Bosnia and Herzegovina
- Direct sales on gates of dairies – buyers are mainly small stores

## **6 MILK MARKET'S - MARKETING ROUTES FOR MILK**

Most of milk produced on farms in Bosnia and Herzegovina moves through the informal market and only one third is sold to dairies by collecting networks. Agricultural producers whom sell milk to dairies have contracts, and dairies are in possession of their own modern farms in order to develop stable supply chain to lower the risk from lack of raw material and price increase, costs of quality and transport costs. Dairies developed network of milk cooling tanks, purchase centers for milk cooling on farms while providing trucks with cooling tanks for milk collecting. Middlemen in trade are equipped, trucks with cooling tanks, and are purchasing milk, and these are usually agricultural cooperatives.

In Bosnia and Herzegovina milk and milk products reach their consumer through five routes

- i. Sale to registered dairies which sell their products to registered shops and supermarkets
- ii. Direct sales
- iii. Green Market
- iv. Consumption by the farm family
- v. Farmer market – middle man

### **6.1 Direct sale and Green market**

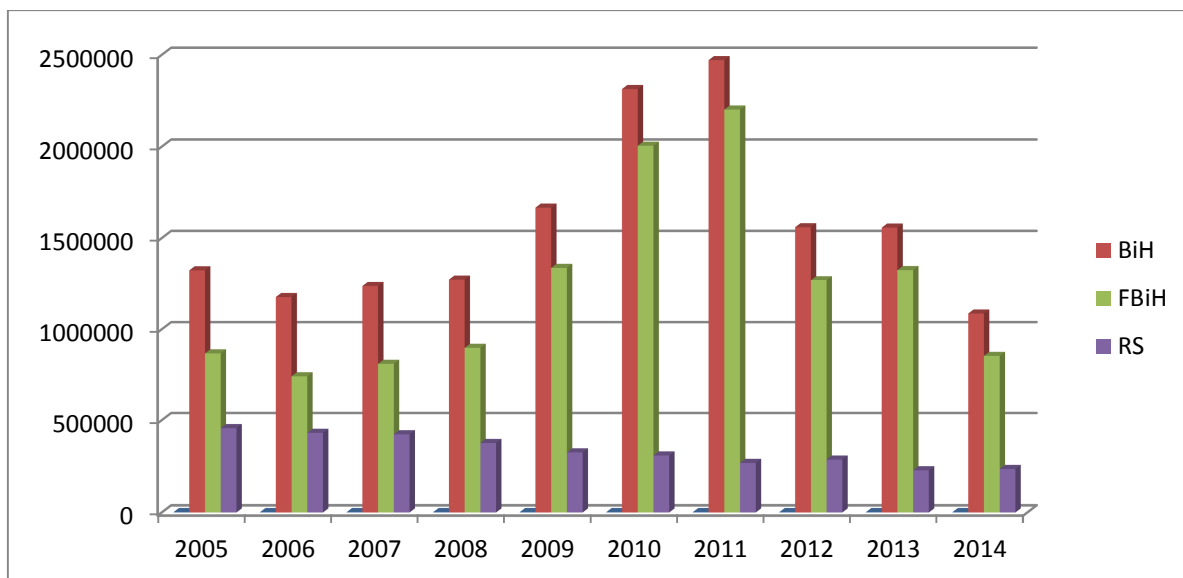
Farmer's who produce milk and milk products most commonly consume these products within their family and surplus of their production is being sold. Traditionally farmers sell their products, in direct sale and sale on Green Market's. Direct sales includes the production and sales of milk in bottles, cheese and other agricultural products in small local communities to consumers (family, neighbours) in near by. Population in villages far from towns and bigger communities often buy products from their neighbours as they are not able to travel to the town (it is far, there is no public transport) or they are used to buy products in this way, considering domestic products as quality and organic/natural one. What is more interesting exchange between producer and customer in this trade, better to say neighbour to neighbour, cousin to cousin or just neighbour to neighbour is "natural" exchange, and this is often a case. To explain it for example;



farmer exchanges one bottle of milk (2 litres) for two pumpkins; or one bottle of milk for half a kilogram of wheat flour or wheat seeds, or kilogram of corn and so on and so forth. The way two people give values to their products and exchange them is just up to them, and they always know the “value” of commodity which they exchange and one for which they exchange.

Small markets or as they are called Green markets in Bosnia and Herzegovina, are being organized in each city. Markets are open throughout the week, or once a week all farmers sell their milk on these Green market's, traditionally called Market day, it is usually Saturday, depending on the city where the markets are. Farmer sells raw milk to his buyer whom is boiling milk home and afterwards this process gets quality local milk. On the markets of this type, bringing together a large number of peasants and farmers with their products, as the town is bigger the market bigger and higher is milk supply, and of dairy products and all agricultural products. Despite the large supply of milk on these markets, consumers are buying milk from producers that they usually know by person and in whom they have confidence, which is based on the quality of milk and dairy products. On these Green markets, the only form of marketing is actually the quality of products (milk quality, depending on the diet of dairy cows, hygiene, price, etc.).

Trade carried out by professional retailers or middlemen whom usually purchase milk from farmers. It is estimated that trade is usually carried out from farms with one cow (about 60%) and without contracts.



**Figure 10 - Sale of milk on green market in Bosnia and Herzegovina, in litres**

*Source: Agency for statistics of BiH, Federal office of Statistics FBiH, Institute of Statistics RS*

Figure 10 shows milk sales on Green markets in Bosnia and Herzegovina and on the level of entities, the Federation of Bosnia and Herzegovina and the Republic of Srpska. In the Republic of Srpska milk sold in markets has declined in the period since 2005. When it was sold 456,842 liters of milk and 2014 when it was sold 235.833 liters of milk, almost 50% less milk in the period of nine years.

The situation in the Federation of BiH and in Bosnia and Herzegovina is somewhat the same. In the Federation of FBiH in the period 2005-2011 sales of milk rose from 869,000 to 2,202,000 liters of milk. After that, there was a decline of 61% in 2014 when it was sold 855,000 liters of milk in the markets. At the level of Bosnia and Herzegovina's sales also grew from 2004 to 2011, from 1,325,842 to 2,471,346 liters of milk. Thereafter in 2014 sales went down by around 56%, when in the same year was sold 1,085,883 liters of milk. On the Green markets are placed following milk products such as cheese, butter, cream, sour cream and other dairy products.

**Table 10 - Sales of milk products in Federation of Bosnia and Herzegovina on green markets (tons)**

Product	2005	2006	2007	2008	2009	2010	2011
Butter	33	36	35	34	27	22	27
Cream	179	173	186	178	173	248	243
Kajmak	60	57	67	76	67	70	60
Cheese (all types)	717	658	787	742	853	892	932
Other dairy products	23	23	41	40	40	42	88

*Source: Federal office of Statistics FBiH*

Table 10 presents data on the sale of butter, cream, cream salt, cheese of all types and other dairy products in the green markets of the Federation of Bosnia and Herzegovina in the period from 2005 to 2011. Sales of cheese is on the rise in the markets, in 2005 has been sold 717 tons of cheese, whilst in 2011 has been sold 932 tons of cheese. Sales of cream is on the rise, with sales from 2005 to 2009 was around 180 tonnes, after which sales increased to 248 and 243 tonnes in 2010 and 2011 sales of butter and cream salt has declined in the same period, according to data from the Federal Office of Statistics. Sales of other dairy products rose from 23 tons in 2005 to 88 tons in 2011.

**Table 11. Sales of milk products in Republic of Srpska on green markets (tons)**

RS sales in tons	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Butter	3	3,8	2,4	1,3	0,9	1,1	1,7	1,3	1,4	0,9	1,2
Cream	54,5	62,5	60,7	80,5	70,2	85,6	75,5	60	57	37	40
Cheese	378	398	362	395	388	300	240	191	166	161	164
Salt cream	21	20	16	13	76	90	77	58	44	52	50
Other products	26	8	11	5	3	4	7	2	2	2	6

*Source: Institute of Statistics RS*

According from data of the Institute of Statistics in RS sales of dairy products on Green markets in the period 2004-2014 is presented in Table 11. Cheese sales are on the decline in the markets of this entity and within ten years of decline ranges from about

56%. The drop of sales records and butter and other dairy products. Sales of cream grew in the period 2004-2009 with 54.5 to 85.6 tons. From 2010 to 2014 sales fell from 75.5 to 40 tons. Salt cream sales from 2004 to 2009 recorded a large increase to 70 tons however in the period from 2010 to 2014 sales of this product fell for the whole 40 tons.

**Table 12 - Prices of milk products in Republic of Srpska on green markets (BAM)**

Product		2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Milk	l	0,99	0,95	0,98	1,01	1,23	1,29	1,12	1,17	1,17	1,25	1,2
Butter	kg	5,79	6,28	7,39	7,59	9,33	9,33	6,75	6,65	7,53	9,01	9,48
Cream	kg	10,68	10,68	10,96	11,56	12,95	14,89	13,44	13,42	13,9	14,03	13,74
Cheese	kg	4,01	3,79	4,25	4,38	5,58	6,78	5,36	5,72	5,92	5,78	5,73
Cream	kg	3,86	3,72	3,65	3,56	4,5	5,56	5,08	5,24	5,18	5,68	5,82
Other products	kg	2,77	4,57	2,64	3,64	3,25	2,64	2,68	2,66	2,9	2,73	2,92

Source: Institute of Statistics RS

Table 13 represents prices of milk and milk products in entity of Republic of Srpska. Prices are expressed in BAM, currency of Bosnia and Herzegovina, Bosnian Convertible Mark.<sup>9</sup> Throughout the period price of milk on green markets of RS varied, and from 2004 to 2009 price increased from 0,99 to 1,29 BAM, afterwards slightly dropped in 2010 and increased again in 2011. Prices of butter, cream, cheese, cream and other products increased throughout the period from 2004 to 2014 in this entity, as it's shown in table 10.

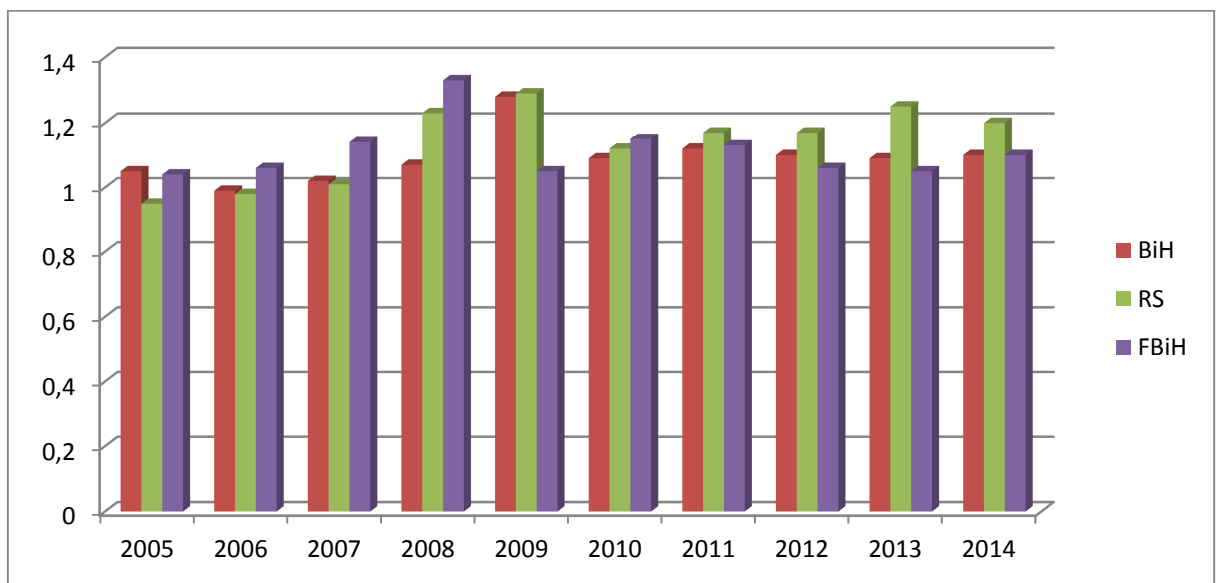
Situation in entity of Federation of BiH is somewhat different considering prices of milk. Throughout the same period prices from 2004 to 2008 rose, from 1,10 to 1,33 BAM, and price was higher in this period from 0,08 to 0,11 BAM in this entity. Later price of milk decreased, same as in the entity of RS, however drop of prices of milk on Green Markets of Federation of BiH was higher, and for example in 2013 price of milk was higher in RS by 0,20 BAM and in 2014 by 0,10 BAM. In the official statistics of this entity data of prices for the same period of butter, cream, cheese and other products is scarce and it's only available data from 2007 to 2011. Price of butter dropped in this period around 0,50 BAM. Moreover prices of all types of cheese on green markets of this entity as it's shown in table decreased significantly by 0,70 BAM, likewise price of cream dropped by 1,30 BAM.

<sup>9</sup> Currency – 1.00 EUR=1,95583 BAM; on 7.4.2016

**Table 13 - Prices of milk products in Federation of BiH on green markets (BAM)**

FBiH	Unit	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Milk	l	1,10	1,04	1,06	1,14	1,33	1,05	1,15	1,13	1,06	1,05	1,1
Butter	kg				8,01	8,18	7,81	8,46	7,64			
Cream	kg				12,91	11,95	13,79	12,89	11,66			
Cheese	kg				5,2	5,09	4,27	4,71	4,5			
Other products	kg				5,45	5,81	6,12	5,06	5,54			

Source: Federal office of Statistics FBiH



**Figure 11 - Prices of milk on green market's in Bosnia and Herzegovina (BAM)**

Source: Agency for statistics of BiH, Federal office of Statistics FBiH, Institute of Statistics RS

Prices of milk on green markets of Bosnia and Herzegovina, and the two entities are compared on Figure 11. Average price of milk on green markets was highest in the entity of RS than in Federation of BiH and on level of Bosnia and Herzegovina according to the official statistics. And while prices of milk in Bosnia and Herzegovina from 2010 to 2014 varied around 1,10 BAM, in Federation of Bosnia and Herzegovina in the same period price decreased almost to 1,05 in 2013, on the other hand in Republic of Srpska average price of milk in 2013 was 1,25 and in 2014 was 1,20 BAM. Throughout period from 2005 to 2014 highest level of average price of milk on green

markets of Bosnia and Herzegovina was in 2008 and 2009 when one liter of milk was around 1,30 BAM.

## **6.2 Shops and Supermarkets**

About 35 percent of milk sold to registered dairies and significant quantities of dairy imports reach final consumer through formal shops and supermarkets. Current retail structure can be divided in three main groups.

### **I. Large supermarkets and hypermarkets**

These include the larger stores of big national and one international retailer. Recently 2013, Konzum from Croatia bought one retail chain, Mercator (Slovenia). While in 2014 biggest domestic retailer Bingo bought two big retail chains, Interex and Tus. At the moment there are two large supermarkets in BiH, Konzum and Bingo. It is also interesting to mention before this big acquisition took place, in two entities one could find different supermarkets. For example in RS Tus was the biggest, and in Federation of Bosnia and Herzegovina Mercator and Interex

### **II. Large shops and small supermarkets**

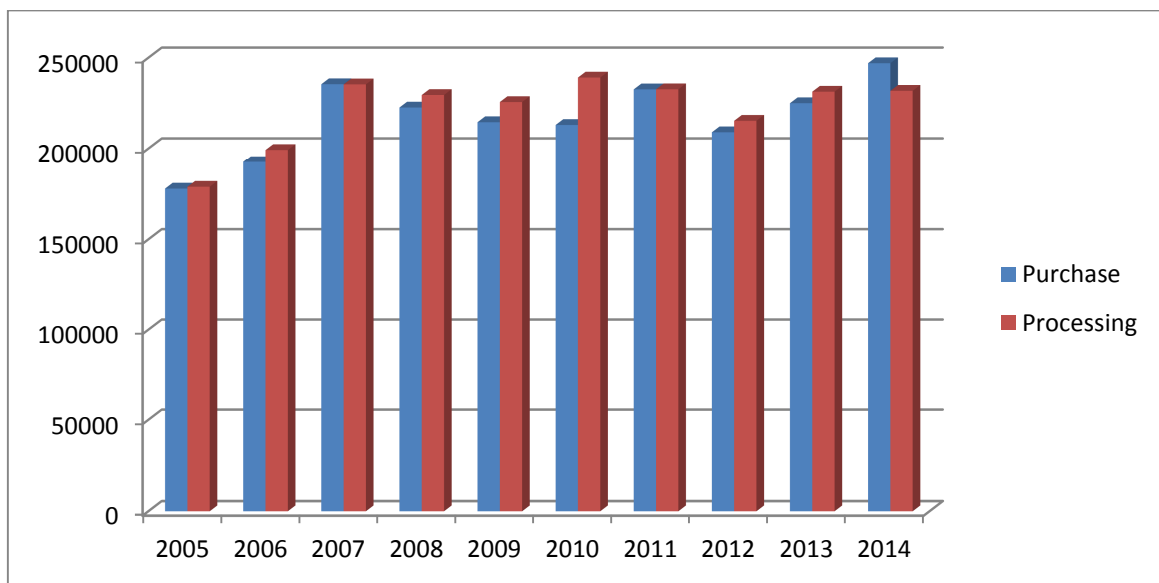
Include smaller stores run by national supermarket groups and Konzum shops. Domestic large shops are Bingo, Robot, Best, Amko etc.

#### **Small shops**

Small family businesses that can be found in every neighbourhood. Located usually in bigger towns and cities. For example in Sarajevo every neighbourhood has small shops and other small independent family shops. While number of these small shops is decreasing particularly in towns and small communities due to the larger shops such as Konzum and Bingo, and probably there is no such shops in towns, maybe one or two. On the other hand bigger

number of small shops usually can be found along the roads, especially for example, major roads leading to the capital city of Bosnia and Herzegovina.

Milk purchased from farmers and cooperatives by dairies after is being processed is transported to retail chains, supermarkets, shop and other smaller markets. Figure 12 represents relation of purchased milk from farmers by dairies and processed milk by dairies from 2005 to 2014. As it is shown throughout this period, and this is according to the official data, mainly dairies in BiH, processed bigger amount of milk than is purchased. Only in 2007 and 2011 amount of milk purchased and processed is equal, on the other hand in 2014 amount of milk purchased is bigger than was processed.



**Figure 12 - Purchase and Processing of milk in Bosnia and Herzegovina (000)**  
 Source: Statistical Agency in BiH

## Konzum

Is Croatian retailer with 250 shops in Bosnia and Herzegovina.

Milk supply in Konzum retail shops can be seen in Table 15. In the table are only shown milk products sold in Konzum and are from domestic Bosnia and Herzegovinian dairies. There is totally 48 milk brands, from which 27 are imported from dairies from Croatia, Slovenia, Serbia and Hungary, in percentage on shelves of Konzum there is around 41% percent of milk from Bosnian and Herzegovinian producers. Milk prices of available milk in Konzum vary from 1 to 1,9 BAM. Mainly in Konzum is available milk

from the biggest dairies Meggle Bihac, Milkos Sarajevo, Mljekoprodukt, PPM and Inner. Moreover Konzum has it's own brand of milk known as Kplus, and producer of this milk is Bosnian Dairy Inner from Gradačac.

**Table 14 - Structure of domestic milks in Konzum (2015)**

Product	Quantity	Price
Meggle 3,2%	1	1,35
Meggle 1,5%	1	1,5
Meggle 2,5%	1	1,5
Vitalia 2,8%	1	1,45
Vitalia 1,5	1	1,45
Mila 2,8%	1	1,1
Milkos 0,9%	1	1,5
Milkos 1,5%	1	1,5
Milkos 2,8%	1	1,5
Milkos 3,2%	1	1,55
Meggle 0,9%	1	1,5
Meggle 3,2%	0,5	1
PPM 2,8%	1	1,2
Milky max	1	1,5
Meggle Ladyrange	1	1,5
Chocolate Meggle	330ml	1
Farma 2%	1	1,9
KPLus 1,5%	1	1,05
Mlijeko UHT 2,8%	1	1
Moja kravica	0,5	1,25
Zbunjola	0,2	0,65

*Source: Konzum Catalogue*



**Table 15 - Structure of creams in Konzum (2015)**

Product	Quantity	Price
Vitalia 12%	900g	2,65
Milkos 20%	180g	0,85
Milks 12%	180g	0,75
Milkos 20%		3,45
Milkos 12%	850g	2,8
Vitalia 12%	410g	1,35
Meggle 12%	410g	1,45
Meggle 12%	850g	2,85
Meggle 20%	850g	3,5
Meggle 12%	180g	0,8
Vitalia 20%	900g	3,35
Domaće blago 12%	850g	2,85
Meggle 20%	410g	1,95

*Source: Konzum Catalogue*

Table 16 shows structure of creams on the shelves of Konzum. It can be concluded that creams are mainly from domestic producers, around 90% of the supply, Meggle, Mljekoprodukt and Milkos. The biggest package of 850-900 grams varies from 2,80 BAM to 3,5 BAM depending on percentage of fat and producer. Smaller packages of 180 grams in cups are sold from 0,75 to 0,90 BAM.

Table 17 presents supply of domestic cheese in Konzum. Generally supply of cheese in Konzum is big and it is consisted around 200 products, from Bosnia and Herzegovina and imported from Croatia, Slovenia, Serbia, Austria, Germany etc. From 200 cheese products, 40 are from BiH. And mainly are famous domestic one, Livno cheese and Travnik cheese, autochthonous cheese from Travnik and Livno, produced by Poljorad Travnik and Livno Dairy. Prices of domestic cheeses vary from 14 BAM to 28BAM, depending on quantity and cheese. On the other hand you can find in Konzum other domestic cheese from producers like Meggle, Milkos and Prozor dairy.

**Table 16 - Structure of domestic cheese in Konzum (2015)**

Product	Quantity	Price
Livno cheese	2,5kg	16,95
Meggle tost	150g	1,8
Meggle ementaler tost	150g	1,8
Meggle chedar tost	150g	1,8
Travnik cheese Poljorad	1kg	14,95
Travnik cheese Poljorad	1kg	9,15
Feta travnik	200g	2,55
Gouda Livno	1kg	8,25
Feta milkos	250g	2,95
Feta milkos	500g	4,95
Farma milkos	250g	2,4
Farma milkos	400g	3,2
Meggle natur	140g	2,6
Livanjac	2,5kg	17,95
Trapist Livno	1kg	18,55
Trapist semi hard	1kg	17,45
Livno cheese	1kg	23,8
Livanjac	1kg	19,6
Trapist puda	1kg	18,75
Mozarella Meggle	125g	2,55
Milkos fresh	450g	2,6
Livanjski pepper	1kg	27,95
Kplus ementaler	150g	2,25
Kplus trokut	140g	2,1
Cottage meggle	250g	7,6
Poljorad fresh	500g	2,7
Kplus ementaler	300g	3,95
Feta Kplus	400g	3,35
Prozorski cheese	1kg	23,15
Livno hard cheese	1kg	17,95

*Source: Konzum Catalog*

*Table 17 - Structure of domestic yogurt in Konzum (2015)*

Product	Quantity	Price
Meggle	150g	1,3
Milkos	1l	1,7
Milkos	1kg	1,85
Vitalia	1l	1,75
Vitalia	1l	1,8
Meggle fruity	150g	0,85
Meggle	180g	0,55
Meggle	850g	2,2
Milkos	1l	1,5
<i>Milks Ayran</i>	<i>1l</i>	<i>1,9</i>

*Source: Konzum Catalog*

Supply of yogurt on shelves of Konzum shops is around 120 products. From domestic producers there is yogurt from Meggle, Mljekoprodukt and Milkos Sarajevo, with prices from 0,85 to 1,85 BAM. Likewise shelves are full of imported yogurt with rich supply and variety from Croatia, Slovenia, Serbia, Germany etc.

Furthermore sales of domestic spreads in Konzum are somewhat the same as of yogurt. Domestic yogurts that can be found on shelves in Konzum are from Meggle, Poljorad Travnik, Milkos. Likewise imports make bigger share of shelves imported from countries mentioned above.

*Table 18 - Structure of domestic spreads in Konzum (2015)*

Name	Quantity	Price
Meggle Vajkrem	200g	1,75
Mizo Vajkrem	200g	1,6
Milkos Vajkrem	100g	1,1
Kplus kajmak	200g	2,95
Poljorad Kajmak	200g	2,8
Poljorad Kajmak	100g	1,6
Milkos natur	200g	1,7
Mizo Vajkrem	200g	1,65
Meggle Kajmak	200g	2,85
Meggle Vajkrem	100g	1

*Source: Konzum Catalog*

## Bingo

Is domestic retailer with around 160 shops in Bosnia and Herzegovina. This retailer emphasizes its sales of domestic products, and of domestic milk and milk products. In table 16 is showed some of the domestic products that can be found on shelves of Bingo. Supply of milk and milk products is somewhat different from Konzum, and in Bingo customer can found milk from different domestic producers such as Nocko Zivinice dairy, located near Tuzla, where is the seat of Bingo.

**Table 19 - Structure of domestic milk products in Bingo (2015)**

Product	Quantity	Price
Natura milk	1l	1,1
Bingo milk	1l	1,1
Milk Land	1l	1
Nocko milk	1l	1,2
Meggle	1l	1,5
Milkos	1l	1,4
Vitalia	1l	1,4
Cheese Nocko	410g	1,95
Cream Nocko 12%	800h	2,45
Cream Nocko 20%	800g	2,95
Cream Nocko 26%	800g	3,3
Nocko Jogurt	1l	1,44

*Source: Bingo Catalog*

Table 20 shows average consumer prices of milk, cheese and butter from 2010 to 2015. Average milk price increased throughout period from 1,41 BAM in 2010 to 1,50 BAM in 2015. What is increase in 0,09 BAM in five years. Average price of cheese increased from 2010 to 2013 from 10,96 BAM to 12,34 BAM, afterwards in 2015 price decreased per kilogram by 2,24 BAM. Average consumer price of butter increased significantly throughout period from 14,2 BAM in 2010 to 17,4 BAM in 2015, by 3,2 BAM per kilogram.

**Table 20 - Average consumer prices of milk, cheese and butter in Bosnia and Herzegovina**

Product	2010	2011	2012	2013	2014	2015
Milk	1,41	1,47	1,48	1,51	1,5	1,5
Cheese	10,96	12,2	11,9	12,34	11,2	10,1
Butter	14,2	16,8	16,55	16,64	17,2	17,4

*Source: Agency for statistics of BiH*

### **6.3 Consumption of milk and milk products**

According to the official statistics average monthly expenditure per household for milk and other milk products is about 5%, expressed in money it amounts around 66 BAM in Republic of Srpska and 76,80 BAM in Federation of Bosnia and Herzegovina in 2011. In Federation of BH, average monthly expenditure on milk and milk products in urban regions is 81,07 BAM, and in rural regions 73,21 BAM. In Republic of Srpska consumption of fresh milk per member in 2004 amounted around 78 litres of milk, after in 2007 decreased to 72 litres. Consumption of yogurt increased throughout this period from 2004 to 2011 in RS from 17,8 to 18 litres per household member. Consumption of other dairy products in RS increased from 4,6 to 4,8 kilograms. In BH consumption of milk decreased between 2008 and 2009, from 186,1 litres to 150 litres. Cheese consumption in the period from 2009 to 2013 increased, by 0,3kg and in 2013 was about 3,3kg.

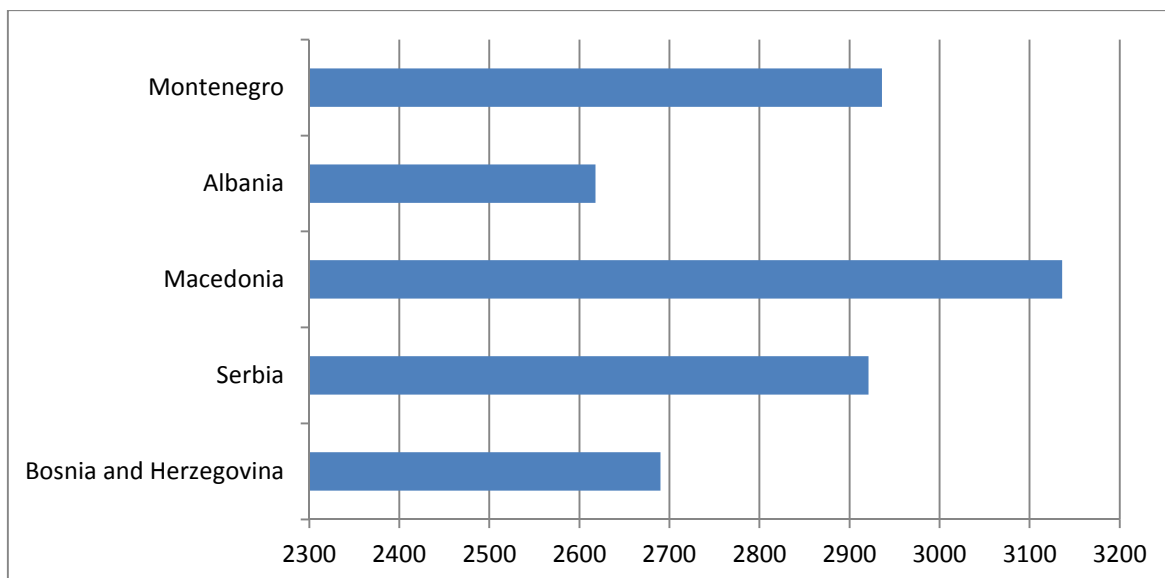
## **7 INTEGRATION PROCESS OF MILK COMMODITY CHAIN IN BOSNIA AND HERZEGOVINA**

In September 2015 The Standing Committee on the food chain and animal health of the European Commission in Brussels with the vote of majority of 28 EU member states decided that Bosnia and Herzegovina can export milk and milk products in EU. This committee rejected Croatian complaint from June for milk export from Bosnia and Herzegovina, as Croatia put complaint on this decision.

This decision enabled export to four BH's dairies certified for milk export, Milkos Sarajevo, Dairy Livno, Meggle Bihac and Mljekoprodukt Kozarska Dubica. Several more dairies waiting to be on list for export from which are two from Livno and Pađeni Hercegovina. This is great step forwards for BH milk sector, milk production and agriculture. Milk production one of the most competitive sectors in BH, have opportunity and stimulus to improve this sector and move forwards into one stable sector.

### **7.1 Primary milk production**

Primary milk production within this chain is struggling with numerous issues. First of all analyses of primary level of milk production showed clearly fall in number of cows in Bosnia Herzegovina by 7% during period of ten years. This reflected on total milk production, and from 2010 to 2014 total milk production decreased in BH about 10%. On entity level in Federation of BiH, total number of cows increased from 2010 to 2014 by 10% and in Republic of Srpska number dropped about 23%. Average yield per cow in BH increased from 2006 to 2014 by 21% and in 2014 was 2,690 litres per cow. In FBiH average yield per cow in 2014 was 2,577 literes, and from 2006 to 2014 yield increased about 23%. In entity of RS average milk yield per cow is about 2,800 litres per cow. Comparing to neighbour countries and CEFTA members, in 2014 average yield per cow was 3,136 litres in Macedonia, 2,936 litres in Montenegro, 2,921 litres in Serbia and 2,618 in Albania.



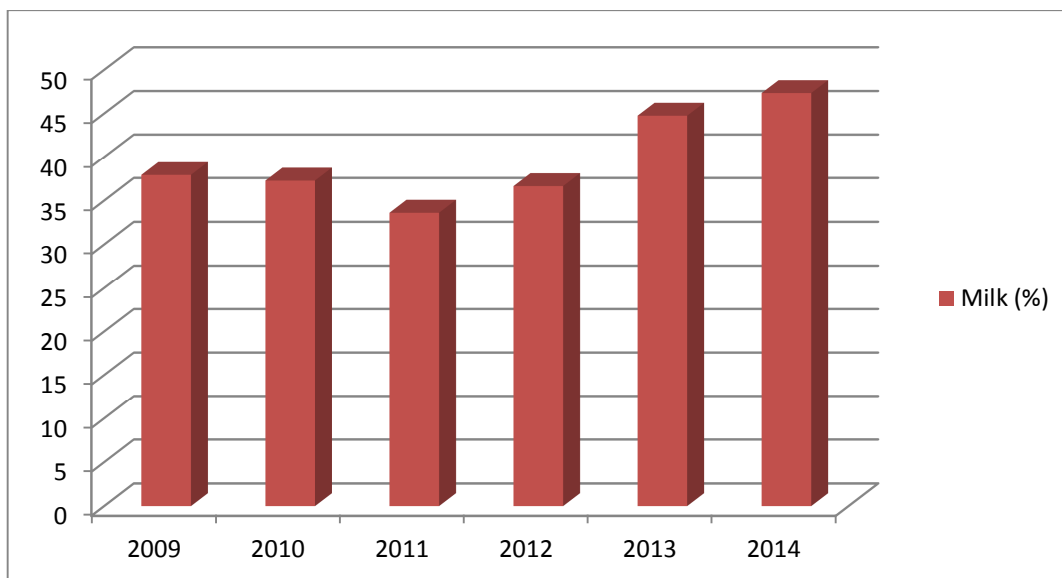
**Figure 13 - Average milk yield per cow in CEFTA countries, 2014 (litres)**

Source: FAO

Furthermore while there was a drop in primary milk production, purchase of milk from farmers by dairies increased during the same period from 2004 to 2014 by 21% and marketability increased by 7% according to statistical data, and in 2014 was 33,8%, what is still low. While it's a positive trend, comparing to Croatia's 77% and Serbia's 65% share of milk that dairies purchase from farmers.

Here should be mentioned catastrophic floods and weather events in May 2014. It is estimated that total losses from damages are about 366 millions of BAM. Flooding affected about 70,000 hectares of most productive agricultural land and about 55,000 hectares of crops was lost. 5,000 heads of cattle were lost and losses in crop production are 131 million of BAM. Livestock sector is considered after crop production second most affected with 19% of losses.





**Figure 14 - Distribution of support for milk (%)**

*Source: Report on Agriculture in Bosnia and Herzegovina, 2014*

Livestock sector is dominated by a large number of small farms, about 80% of farms from 1 to 5 cows. Issue here is mainly in efficiency of such small farms. Farms from 1 to 3 cows with low yields per cow, have high production costs, and are not able to cover they costs, and compete on market. High production costs per liter of milk and low purchase price is a major problem for majority of these farms. Subsidies in BH are payed on entitiy level and according to data milk and milk products hold dominant level of support comparing to other sectors and in 2014 about 47,35% from total distribution was directed in milk sector, and comparing to 2008, support for milk and milk products increased by 10%.In Federation of BH in 2010 support per one liter of milk was 0,16 BAM, comparing to 2007 subsidies for one liter of milk was 0,14 BAM.

Solution for small farms is joining in together in agricultural cooperatives<sup>10</sup>. In 2002 there was about 221 farming cooperatives in BH, comparing to 196 in 1991. From 221 farming cooperatives, 204 or 92% are general cooperatives and 17 or 8% are specialized cooperatives. In Federation of BH in 2002 there was 94 general and 7 specialized farming cooperatives, 110 general and 10 specialized farming cooperatives in Republic of Srpska. Considering number of farming cooperatives increased comparing to pre-war situation however this process is slow. Most of these cooperatives are general, not specialized, and image of BH farming cooperatives today looks like a simple organism. Barriers for BH farming cooperatives are following:

<sup>10</sup> Selak et al – Poljoprivredno zadrugarstvo/Agricultural cooperatives

- i. the unresolved status of cooperative assets from earlier times;
- ii. bad experience of farmers from prewar time;
- iii. weakness of new law for cooperatives;
- iv. lack of favourable credit lines for agriculture;
- v. fragmented land in agriculture; unregulated market;
- vi. lack of professional staff with European experience; lack of professional advisory services organized by country;
- vii. absence of state interest for cooperatives;
- viii. absence of strategy for production of own food.

## **7.2 Milk industry**

Situation in second part of milk commodity chain of Milk processing, is somewhat better than in primary milk production and a lot has been done in investing and modernizing of milk industry. In milk industry gradual modernization and expansion of processing capacities took place from 2005, and mainly all dairies are privately owned. Furthermore foreign companies invested in dairies and in new varieties of products, influencing on decrease of number of dairies, particularly dairies with limited production. However mainly production programs of dairies are traditional, and for majority of dairies in Bosnia and Herzegovina is difficult to compete on market with biggest dairies in BH and strong imports.

As only four dairies out of 37 registered and 30 in function throughout all year are able to compete and to place their products in the biggest retailers in BH, on shelves with number of other import products particularly cheese from import. Milk processing increased about 29% from 2005 to 2014, however utilization of milk processing capacities is still low and in 2014 in BH was about 50%. Capacity utilization in Federation of BH in 2014 was about 40% and in Republic of Srpska 60%. Furthermore from 2009 onwards capacity utilization in FBiH decreased about 8% and in RS increased by 10%.

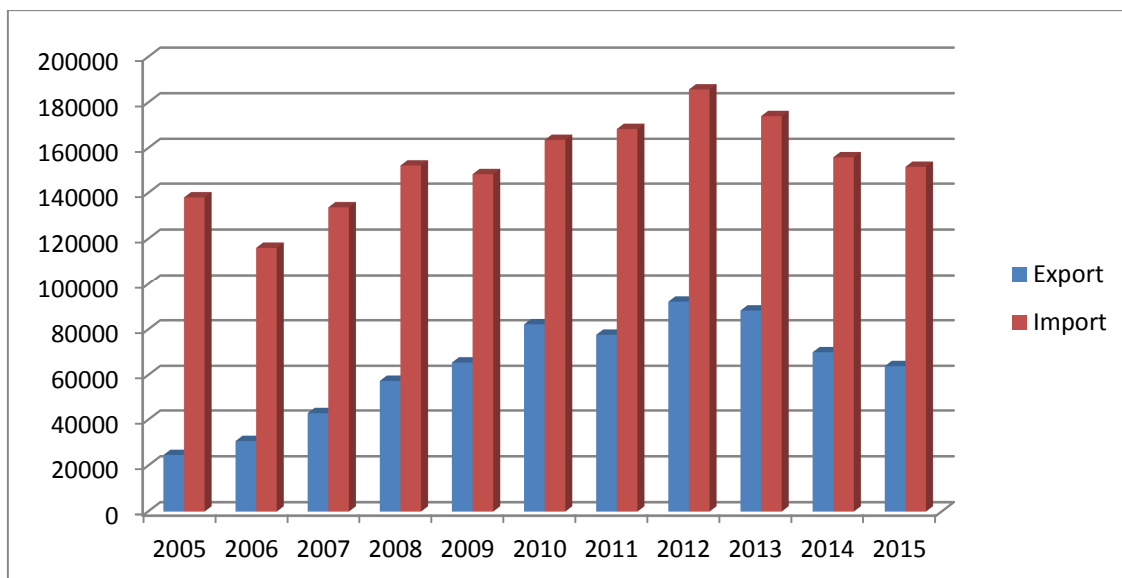
Generally problem of low capacity utilization is due to the lack of raw material as it is mentioned above total milk production dropped. Majority of dairies is facing a problem

of lack of raw material throughout all year. Biggest two dairies in BH, Meggle and Mljekoprodukt have each around 3000 cooperatives, or farmers from whom they purchase milk. In entity of Federation of BH, five biggest dairies have approximately about 7000 cooperatives, and three biggest dairies in entity of RS have around 6000 cooperatives from whom they purchase milk.

Due to the fact about problem of lack of raw material, it would be interested for further researches to investigate sources of raw material/milk in BH dairies? As there is a clear lack of raw milk, such problem could be easily solved by import of raw material as it's practice in the other sectors. Another problem dairies face within distribution of their products and it's a problem for small and medium dairies to enter on the market and their products to find a place on shelves of two biggest retailer Bingo and Konzum. It's necessary to pay fee for entry and sales of products and usually large quantity is necessary what is an issue even for medium size dairies. Retailer is late with the payment, it's necessary 90 or 120 days for dairy to receive payments. Situation and policies with retailer puts dairies in difficult position in business environment in Bosnia and Herzegovina. Moreover dairies should invest a lot more in marketing in order to find their place on market and to meet the challenges of competition from import.

### **7.3 Import and Export of milk and milk products**

Export of dairy products decreased from 2012 to 2015 in Bosnia and Herzegovina by about 30%, and on the other hand import of dairy products decreased in the same period by about 18%. The import of agricultural products, milk makes about 5%, on the other side of the export of agricultural products milk between dominant commodities and makes about 10%. In 2015 value of exported milk was 63,9 millions BAM, compared to 70,6 millions BAM in 2014, export decreased by 6,7 millions BAM. The largest share in exports of agricultural products in 2014 had CEFTA with share about 40,93% and EU with share 37,83%. The largest share in import of agricultural products in BH had EU 56,28% and CEFTA 28,69%. Export of agricultural products in EU decreased by 27,22% in 2014 while import from EU increased by 0,61%. The exports of agricultural products in CEFTA countries increased by 1,11% and imports increased by 9,19%.



**Figure 15 - Import and Export of dairy products in thousands of BAM (2005-2015)**  
 Source: Chamber of Trade and Economic Relations in BiH

The exports of agricultural products countries of EFTA increased by 7,79%, while imports significantly increased about 46,85%. Bosnia and Herzegovina suficit with EFTA countries decreased by 79,35%, and coverage of imports by exports is smaller by 38,53% comparing to 2013.

In 2014 exports of agricultural products to Turkey increased to 137,23%, while import from Turkey rised by 0,74% and in 2014 BH made suficit in trade with Turkey in value about 53,70 millions BAM. Foreign trade of agricultural products between BH and Republic of Croatia show that exports in 2014 decreased by 40,4% mainly due to inability of export commodities of animal origin, such as milk. On the other hand import from Croatia decreased far less, about 15,5%. In 2015 export of agricultural products in Croatia stayed on the same level as in 2014, and it was about 64,5 million. The import from Croatia in 2015 continue to grow and increased by 5,10%.

Serbia in 2014 and 2015 is one of the main trade partners in exchange of agricultural products. In 2014 export to Serbia was higher by 15,7%. On the other hand in 2014 import from Serbia in 2014 increased by 12,2%. In 2015 export to Serbia increased by 0,75%, on the other hand import of agricultural products from Serbia increased by 1,20% comparing to 2014. Milk is dominant agricultural product in trade with Serbia and makes about 15,7 millions in value of export.

## **8 PRICES OF RAW MATERIAL AT DIFFERENT STAGES OF CHAIN**

### **8.1 Farm level prices**

Bosnian and Herzegovinian farmer can sell milk directly, on green market and to dairies. Mainly third option makes biggest share in sales, and it's estimated that around 40% of all milk production is purchased by dairies. Therefore is important to maintain his position on the market, maintain efficient production, minimise costs, particularly costs per liter of produced milk. By size farms are divided to small, medium and big farms in lowland and mountainous regions. And for this purpose author used data from research on production of milk in Bosnia and Herzegovina<sup>11</sup>. Author used approximate estimation of costs per liter influenced by different factors, main one is size of the farm. It is important to mention that chosen farms are commercial and market oriented.

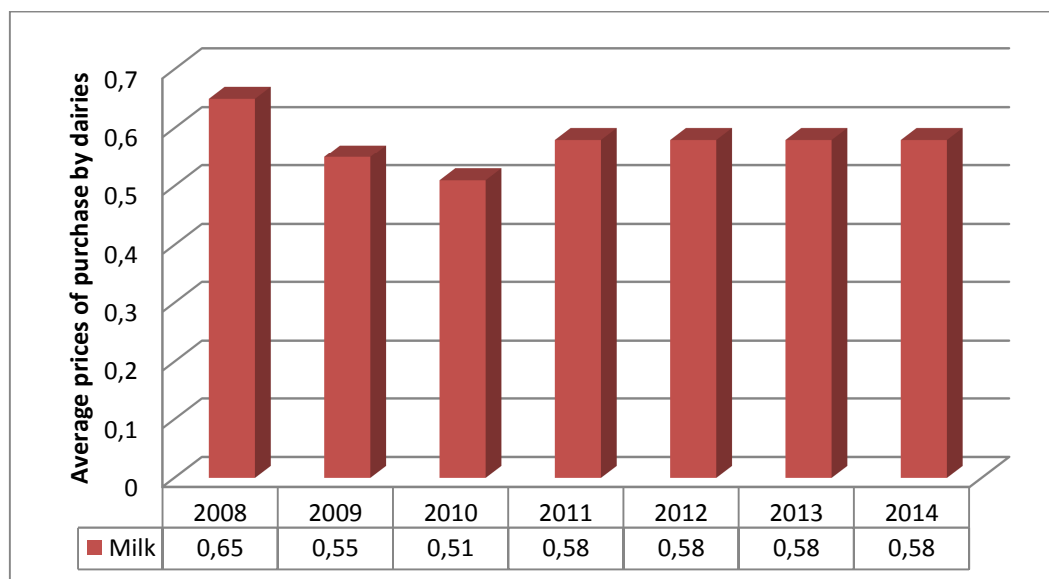
Firstly farms in lowland region by size are small, medium and big. Average yield per cow on small farm is estimated 4,333 litres and average number of cows is 4,5. Total production is estimated around 19,950 litres on yearly level. Average cost of production of one liter is 0,57 BAM. Cost of production of one liter increase in case farms have less than 4 cows, to 0,62 BAM per liter. Medium size farms have approximately 10,8 cows per herd and produce on average 45,438 liters yearly, average yield 4,227 of litres, cost of production on one liter is 0,53 BAM (varies from 0,49 BAM to 0,56 BAM). Big size farms have on average 32 cows and produce 178,738 litres on average with average yield per cow 5,586 of litres. Cost of production per one liter of milk on big farms ranges from 0,43 BAM to 0,53 BAM, and average cost of liter is 0,50 BAM

Small farms in mountainous region in average have 3 cows and produce 12,000 litres, average yield is 4,000 per cow and average cost per liter is 0,61 BAM (0,60 BAM-0,63 BAM). Medium size farms have 8,5 cows in average with total production of 28,800 litres of milk, average yield 3,388 litres and cost per liter of milk is 0,58 BAM (0,58 BAM-0,59 BAM). Big size farms in average have 19,5 cows, total production 76,050

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<sup>11</sup> Bajramovic et al „Economics of primary agricultural production and measures of Agricultural Policy“, p.87

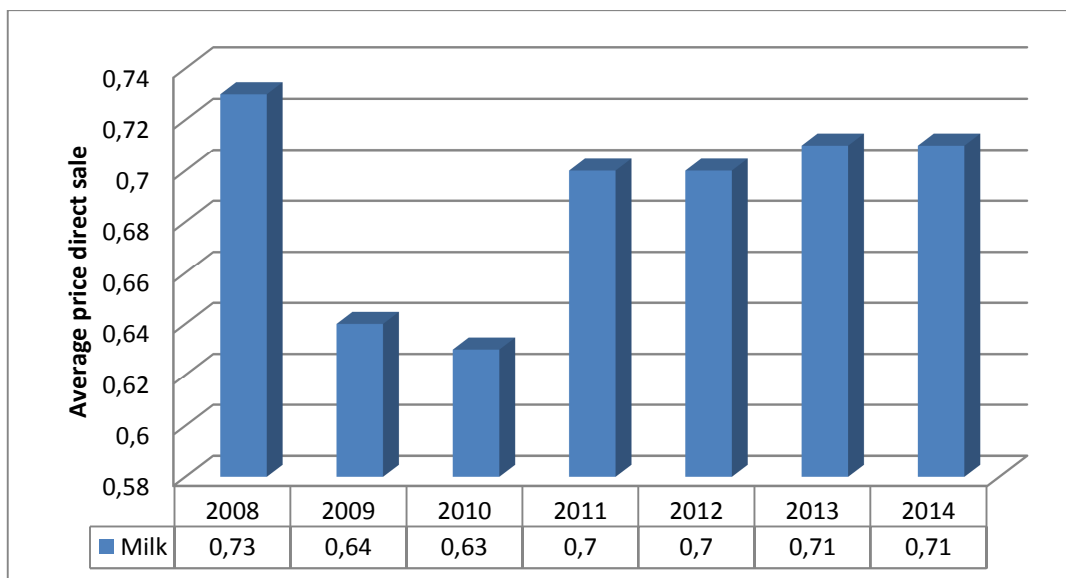
litres, average yield 3,900 and cost of production in average 0,52 BAM (0,51 BAM-0,52 BAM).



**Figure 16 - Average prices of purchase of milk in Bosnia and Herzegovina, BAM**  
 Source: Agency for statistics of BiH

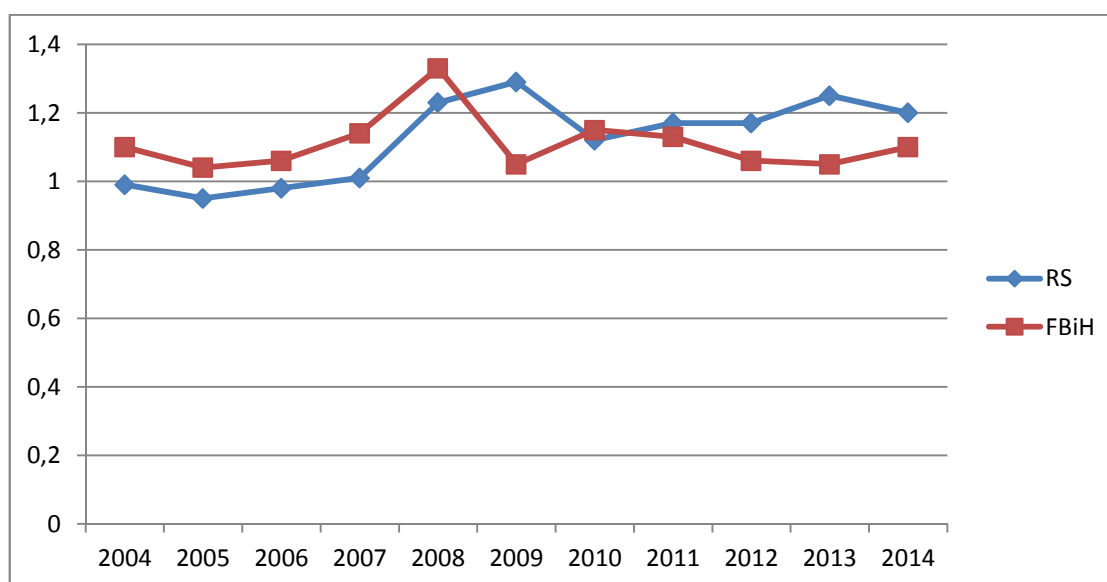
Purchase of milk by dairies increased about 30% from 2005 to 2014. Average price of one liter of milk purchased milk dropped from 2008 to 2010, from 0,65 BAM to 0,51 BAM, after in 2011 increased to 0,58 BAM and stayed on that level to 2014. Therefore in order to maintain position on market farmer in 2014 had to have cost of one liter of milk under 0,58 BAM. Costs of production of one liter of milk on farms in lowland region of BiH ranges from 0,50 to 0,62 BAM, and farms with smaller herd size, under 3 cows, have higher costs and it is estimated above 0,63. These small size farms from 1 to 3 cows with costs around 0,60 BAM and average purchase price 0,58 BAM are in difficulties to maintain their position on market with high costs per liter.

Farms in mountainous regions have somewhat same production costs, between 0,51 to 0,63 BAM. Again small farms have average costs of one liter ranging from 0,60 to 0,63 BAM, higher by 0,02 to 0,05 BAM per liter, with average purchase price of one liter of milk 0,58 BAM. This is when it's about average purchase prices of milk by dairies. Besides farmers can sell their milk directly, on Figure 17 are showed average prices of direct sales of one liter of milk in Bosnia and Herzegovina.



**Figure 17 - Average prices of direct sale of milk in Bosnia and Herzegovina, BAM**  
 Source: Agency for statistics of BiH

Average price of direct sales decreased from 2008 to 2010 from 0,73BAM to 0,63 BAM, afterwards increased in 2011 to 0,70 BAM and in 2013 and 2014 to 0,71 BAM. Comparing average purchase and direct prices, direct prices are higher, however as it is presented on Figure 17 average price of direct sale as well dropped throughout period from 2008 to 2014.



**Figure 18 - Average prices on Green market in Republic of Srpska and Federation of BiH, (BAM)**  
 Source: Institute of Statistics RS

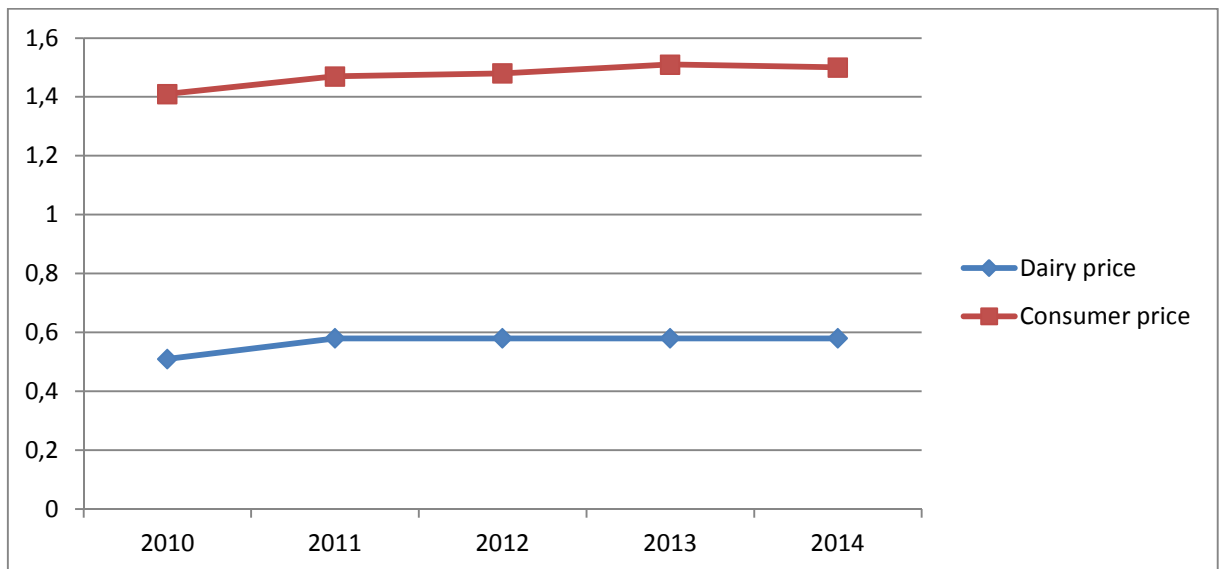
Figure 18 presents prices of milk on Green market in two entities. In Federation of BiH price of milk on Green Market's increased from 2005 to 2008, from 1,04 BAM to 1,33 BAM. In 2009 price dropped to 1,05 BAM. In 2014 price of one liter of milk on Green Markets of FBH was 1,10 BAM. In Republic of Srpska price of milk increased from 2005 to 2009, from 0,95 BAM to 1,29 BAM per liter. Afterwards price dropped and it was in 2014, 1,20 BAM, 0,10 BAM higher than in Federation of BiH.

Production costs per liter for farms in lowland and mountainous region, divided by size presented above, their production efficiency and profitability increases with farm subsidies and support. For example small farms in lowland with subsidies, that have share around 17% in total revenues, farm efficiency is increased from 1,12 to 1,35. On medium farms efficiency with subsidies increases from 1,16 to 1,42. Efficiency of big farms with subsidies increases from 1,33 to 1,61, with profitability around 61%. On the small farms in mountainous regions subsidies have share around 19% of total revenues, and enabled to make a profit than loss. On medium farms coefficient of efficiency is around 1,08 and it is minimum threshold for efficient production, and with subsidies efficiency increases to 1,32. On big farms with average size around 20 cows, coefficient of efficiency is 1,20, and with subsidies increases to 1,46.



## 8.2 Dairy and consumer price

Due to the insufficient available data on average consumer prices, on Figure 15 is presented recent data from 2010 to 2014. And it is showed that average consumer price for one liter of milk in supermarkets increased throughout four years by 0,09 BAM. On the other hand average dairy price of raw milk stayed on the same level in the same period, and as it can be seen above on graph 13 it decreased, according to the official data. Therefore in 2013 was highest average price of milk in supermarkets, 1,51 BAM and average purchase price of milk was 0,58 BAM, with difference about 0,93 BAM in average.



**Figure 19 - Average dairy and consumer prices , BAM**

Source: Agency for statistics of BiH

## 9 PROBLEMS IN THE MILK COMMODITY CHAIN

### 9.1 Issues on farm level

There are numerous problems on the farm level in milk production of milk commodity chain in Bosnia and Herzegovina, issues that follow farmers and are main factors and reasons for situation as it's presented in this sector. Author specifies further below main problems on farm level within milk commodity chain concerning small amount of production and structure of production.

- I. Sector of agriculture is dominated by large numbers of farms that are very small, and land parcels are fragmented into many small parcels – around 80% of farms have 1 to 5 cows, mainly 1 to 3, influencing on farm efficiency as such farms have high production costs per liter of milk and with low purchase price of milk, faced with losses;
- II. Unfavourable structure of breed – Simmental breed is dominated, while Holstein-Friesian breed makes around 8,5%;
- III. Low yields per cow are characterized by inadequate feed of animals and choice of breed for production.
- IV. High transaction costs and costs of quality control.
- V. This follows lack of arable land for production of forage, lack of proper objects and equipment for animals and adequate mechanization;
- VI. Lack of mechanization for land cultivation, sowing, harvesting and storage of forage;
- VII. Furthermore investments and subsidies are insufficient and small for modernization of production; subsidy in 2010 in Federation of BiH was 0,16 BAM per liter and in Republic of Srpska in range from 0,10 to 0,22 BAM, what is for producers unfair and puts them in unequal position due to the simple fact focus of these subsidies are quantity and not quality;
- VIII. Farmers, producers and farm staff are not trained in order to manage their farms to be efficient units and market oriented;
- IX. Absence of professional advisory services organized by country

- X. Farmer's distrust – it's difficult to gain farmer's trust as consequence of bad experience from prewar
- XI. Lack of favourable credit lines for agriculture;
- XII. Fragmented land in agriculture; unregulated market;
- XIII. Absence of strategy for production of own food in Bosnia and Herzegovina

## **9.2 Issues on processing level**

Milk processing takes place on farmer level (small quantities) and in about 30 dairies in Bosnia and Herzegovina. Dairies are making great efforts in upgrading their systems of quality and are introducing standards, however still facing problems.

- i. Absence of economies of scale due to unfavourable structure of sector;
- ii. Level of capacity utilization is low; around 55% in BiH, causing costs per unit of processed milk; on entity level in Republic of Srpska is somewhat higher than in Federation of BH, 60% to 40%;
- iii. Difficulties with raw material supply;
- iv. Traditional structure of production programs – mainly short-dated products and small number of products with surplus value
- v. Limited marketing and innovation activities;
- vi. Variable quality of raw milk and high cost of milk collection as tankers have to collect small quantities from many farmers and collection centres;
- vii. Poor financial results because of the low level of utilization of processing capacity

### 9.3 Issues on market level

Producers are faced with following problems with retail chains:

- i. Usually it is necessary to pay entry fee and fee for sales of products
- ii. Retailer seek for high price discounts
- iii. Strict policy of product return – retailer do not want to participate in transaction costs
- iv. Payment usually after 90 or 120 days
- v. Futhermore market is not organized and cooperation between producers and processors is weak. Market is faced with uncontrolled imports – as it is mentioned in text earlier for example in milk supply of one of the biggest retailers, around 60% of milk on shelves is from import; and from 37 registered dairies, on shelves milk is available only from 5 domestic dairies; what makes that around 25-30 dairies registered are marketing only on smaller markets, local communities and regions; Furthermore for instance rich supply from imports make 50% to 70% of shelves depending on retailer.
- vi. Number and variety of dairy products is limited – as it is presented in description of dairy programs of different dairies, and what is confirmed on market, only two biggest dairies Meggle and Mljekoprodukt with variety of products are able to be competitive with imports; and domestic dairies focused on production of quality cheese, Livno and Poljorad for example;

## 10 CONCLUSION

One should always keep in his mind what ancient Greek writer Xenophon once had in his mind, “When agriculture bloom, all other arts (activities) bloom as well, when agriculture regress together regress all other on sea and land.”

Today twenty four years after independence Bosnian and Herzegovinian agriculture has old and new problems, likewise milk sector considered as most competitive sector today and of key strategic role for future. Negative trend of milk production followed up after 2009 until production moved upwards with positive trend. This negative trend in milk production is a brake for milk industry as majority of dairies are facing two problems here. First one is a lack of raw material in BH and second one is strong imports.

Problem of lack of raw material leads with it all problems in milk production. Following analysis of sector in this Master thesis, biggest problems proved to be, with negative trend of milk production, negative trend of number of cows and small milk yields regardless to increase of milk yield. Small farms make majority and there is nearly 80% of such farms today. These farms with 1 to 3 heads per head find difficult to compete on market and therefore mainly most of these farms are not commercial and are not market oriented. In order to encourage peasants and farmers not to leave production it is necessary to invest and support them with subsidies.

Subsidies in milk sector make dominant share from all subsidies in agriculture what is about 47% in 2014, and subsidies increased after 2008 by 10%. Increase of subsidies is a move further however in absence of good strategy for production of own food, improvements in milk sector are as well in absence. The fall in number of cows and in production is a good argument. Majority of smaller farmers are not efficient, they have high costs per liter of produced milk therefore they decide to leave production or just to produce for their own consumption or for smaller market, green markets for example. While the subsidies are rather small it's difficult for farmers to buy inputs, feed mainly, due to the fact they do not produce their own in absence of land and so on and so forth.

Farming cooperatives as a solution for small farms and milk sector in general today is their image of simple organism. While there is a positive trend in farming cooperatives

comparing to 1991, moreover new law considered as weak on, there is a small number of specialized cooperatives and mainly they are general farming cooperatives. This is mainly due to absence of state interest for such agricultural practices. And once again Bosnian farmer is vulnerable and left on his own.

To worsen the situation in May 2014, BH suffered catastrophic floods, making damage in agriculture and losses about 131 million in crop production and livestock sector is a second most affected with about 19% of losses. This additionally influenced the negative trend in milk production.

Furthermore while there is an increase of milk purchase from dairies throughout period from 2005 to 2015, and an increase in processing in the same period followed on the other hand with drop in milk production. Question is had dairies due to the lack of raw material begun to import raw material elsewhere? As this is a practice in other sectors in agriculture of BH. While there is no official data about imported raw milk, interesting would be to mention that biggest five dairies of BH have their plants on the borders of BH to Croatia and Serbia, moreover majority of dairies are near borders while some are in central BH.

Additionally to problem of lack of raw material, due to the fact dairies are not able to utilize their capacities and average capacity utilization in milk industry is still low, about 50-55%. Milk industry in BH deals with problem of strong imports. Unprotected Bosnian and Herzegovinian market is flooded with imports of milk and milk products and regardless to official statistics that total imports decreased from 2013 to 2015, market shelves of supermarkets and shops in BH prove opposite. In Konzum one of the biggest retailer in BH, for example there is about 60% of milk from imports. Furthermore shelves of the same retailer are rich with supply of cheese, within 200 cheese products, about 20% are domestic BH, mainly indigenous BH cheeses Livno and Travnik.

This should be a lesson to BH milk industry in moving towards investing in marketing, and expanding of their production on new products i.e. special cheese, fruit yogurt, flavoured products and so forth and so on. For example biggest dairies such as Meggle Bihac, Mljekoprodukt Kozarska Dubica, Milkos Sarajevo, Inmer Gradačac found their place on shelves of BH big retailers with major investments in their marketing and production programs. However majority of dairies in BH are still focused only on local

markets, due to the fact they are no competitive comparing to other dairies in BH and strong imports.

In 2013 after Croatia's exit from CEFTA and entry to EU, BH and milk industry lost biggest export partner and thereafter until today exports of milk and milk products decreased to Croatia. Positive step happened in 2015 after the decision The Standing Committee on the food chain and animal health of the European Commission enabled export to four BH dairies. In the same year Milk sector has been declared as most competitive one, strategic for the future in having leading role in moving towards of BH agriculture.

As there are positive steps in BH Milk Commodity Chain the biggest problems is still there where it all starts, in Agriculture and in Milk production. One should be aware that without solving problems in primary milk production, BH milk industry and domestic milk production cannot make steps forward. With facing new problems of strong competition on market, laws and other requirements, and not solving old one's there is no moving forward.

In the terms of ongoing integration processes, milk industry need to move forwards together with milk production and every problem of milk production is a problem for a milk industry and vice versa. Good cooperation and partnership within Milk Commodity chain is necessary, and only strong milk industry will make strong milk production. The most important thing would be developing good raw material base and extending capacities of domestic market in creating production competitiveness. Overall this is a common issue for farmers and milk industry and together they need to find solution. In the end Milk Sector, with given role considered as strategic and most competitive, is faced with a difficult task in future to find deserving place on domestic Bosnian and Herzegovinian market.

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